plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

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AUGUST - 1960

"WE PLATE MISSILE CONTACTS WITH SEL-REX BRIGHT GOLD* -AN EXTRA MEASURE OF RELIABILITY"

—Elco Corporation, Philadelphia, Pa.

The failure of a single component can put even the mighty Atlas Missile out of commission. That's why an electroplate of SEL-REX BRIGHT GOLD is specified to give an extra measure of reliability to Elco's patented VARICON Contacts used in missiles, rockets, computers and similar critical applications.

The VARICON Contact, with its fork-like design and 4 coined mating surfaces, offers exceptional resistance to numerous punishing insertions and withdrawals—meeting or surpassing the most exacting specifications. Patented SEL-REX BRIGHT GOLD, which produces a fine grained, dense electroplate—twice as hard as conventional 24K Gold plate — is a major reason for the reputation of quality and reliability enjoyed by VARICON throughout all industry.

SEL-REX makes the world's largest selection of processes and systems which take the guesswork out of plating with precious metals. Baths are simply maintained with scientific precision by additions of pre-measured salts or solutions. Your assurance of consistent quality results from one batch to the next.

Photo shows Elco's patented Varicon Connectors and unique fork-like contact plated with Sel-Rex Bright Gold.

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*Patented

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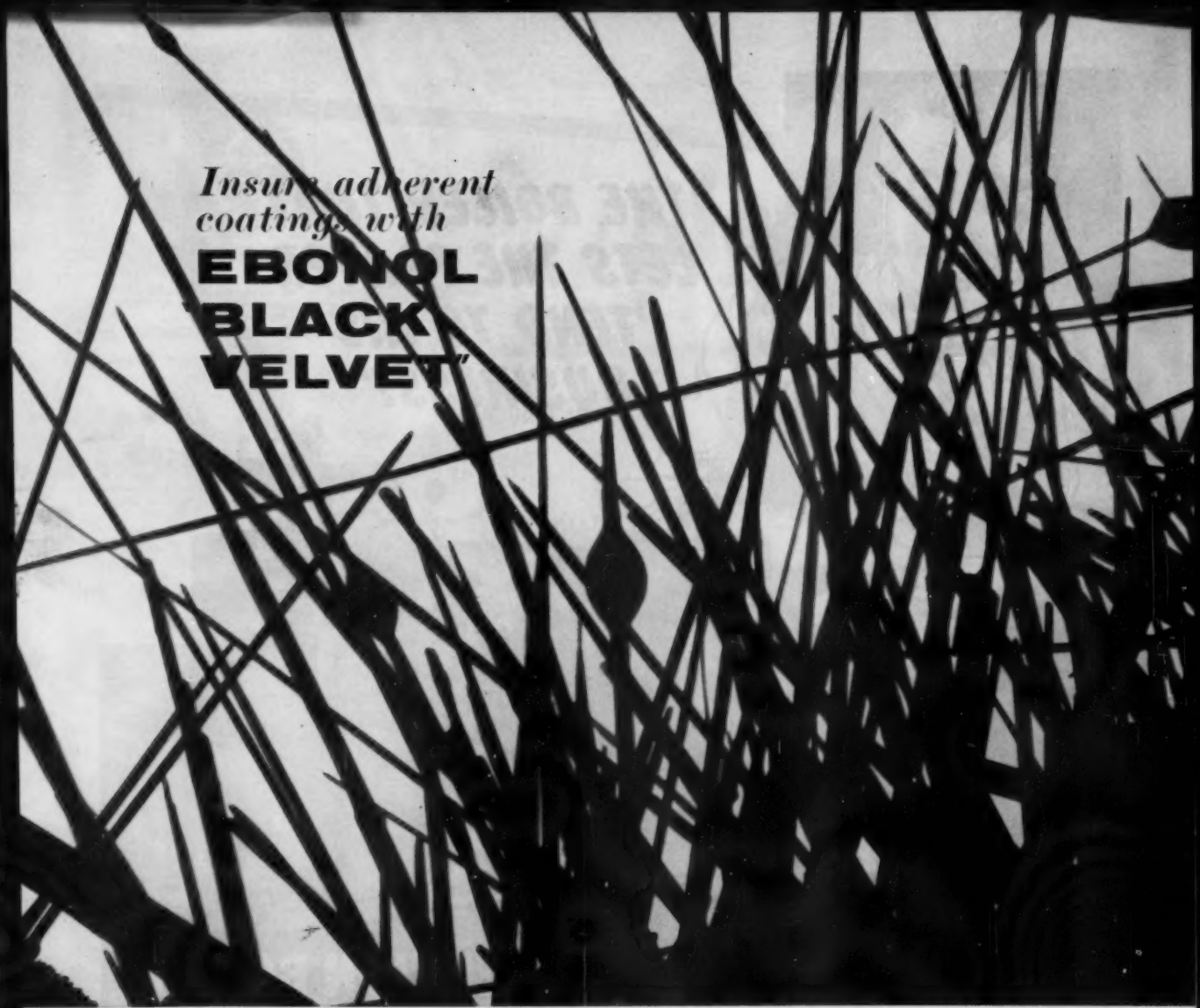

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Photograph of the cupric oxide needles (magnified 6500x) produced by immersion of copper part in hot solution of Ebonol "C" Special.

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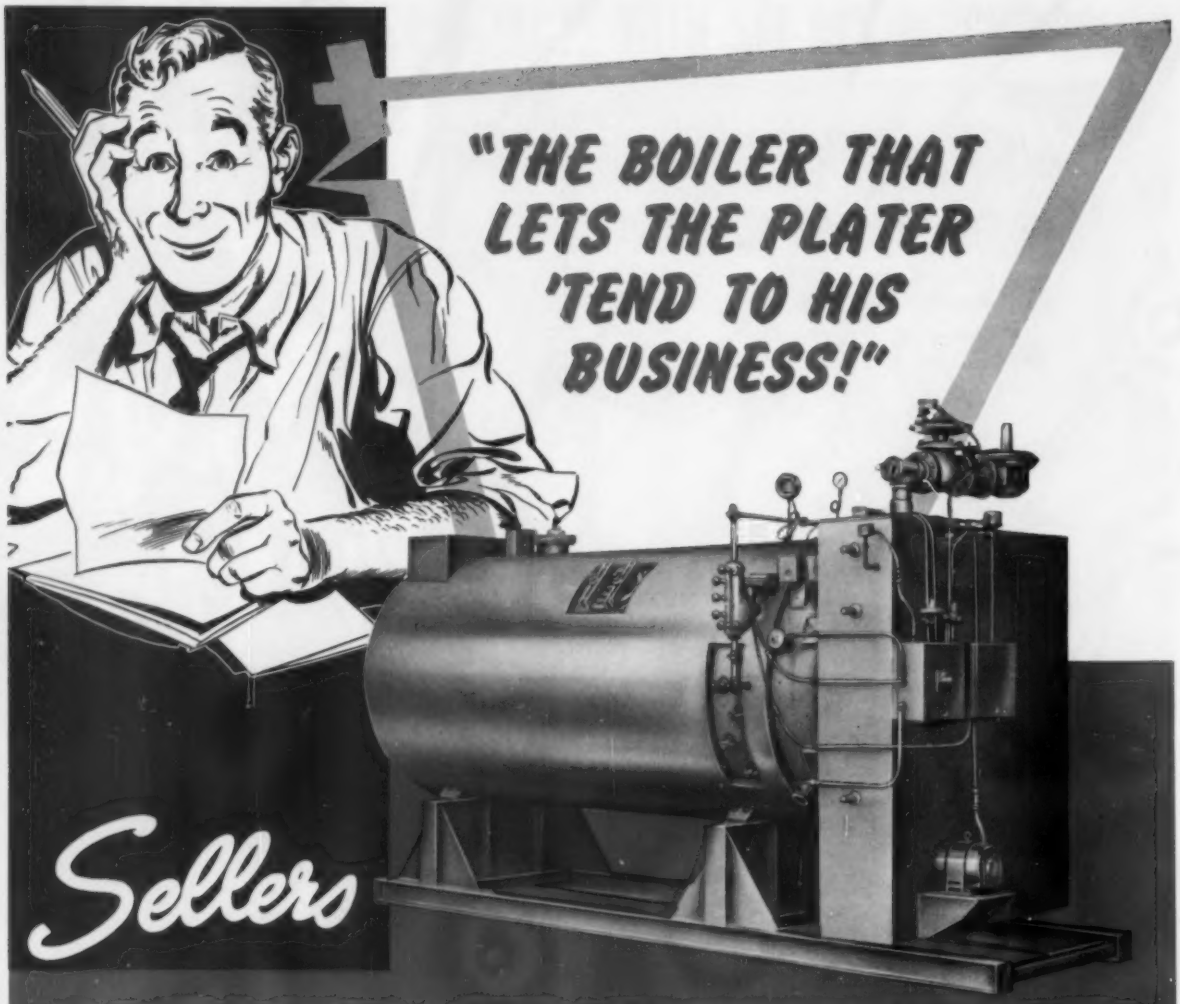

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JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

AUGUST 1960 — AUDITED PAID CIRCULATION — **Vol. 47, No. 8**

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EDITORIAL

PRESIDENT'S MESSAGE

THOSE MEMBERS of the AES who traveled far across the United States for the first time as they trekked to the Los Angeles Convention must have shared the same deep-swelling feeling of pride of country that most of us experience when we learn to appreciate its majesty, vast spaces and greatly varied resources. Our citizens are just as varied in origin, speech and occupation as our terrain is in its aspect. As we make acquaintances from different areas, pride in and love of America mounts in proportion to the number of such contacts.

We all live several separate lives. There are the home life, church life, life of business, community life and life as a citizen of the nation. We may not even behave the same way in each of these spheres. Everyone knows a boss who is a strong, strict disciplinarian at the plant but a weak, indulgent father at home. Another man may not be prominent in his business career yet be a leader in local affairs and become an asset to his community.

In each of our separate lives there is a relationship which seems to be universal. That is, the better we become acquainted with the people involved in a given activity, the more rewarding and useful that part of our life becomes. Just as travel enhances pride and love of country, so a widening acquaintanceship in the community or church enriches these facets of our life even while advancing the purposes of the organization involved.

These thoughts fill my mind as I take over the duties of President. The years of service as Vice-President are years in which friends are made in ever-widening areas of the AES. As he goes on from Branch to Branch, from Region to Region, from one meeting of the Supreme Society to the next, even the most sophisticated individual could not help but develop a great pride in this international organization. To watch the hundreds of men who work for the common cause on Branch and national committees, often without recognition, shows clearly the love so many members share of the objectives of our Society.

I dedicate myself to furthering all opportunities for individual members of the AES to widen their circles of acquaintanceship within the Society. The more this takes place the more reward each member will find in this side of his life, the greater advance will be made toward the goals we have adopted and the more rapid will be the progress of the metal finishing industry.

W. Andrew Wesley

President
American Electroplaters' Society, Inc.

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Conveyor Breakdowns Eliminated with new electro-mechanical control and safety device. Racks can't be pushed into sides of tank; load can't drop if power fails during work transfers.

Positive 6-Point Connections. Self-cleaning heavy duty contacts need little or no attention.

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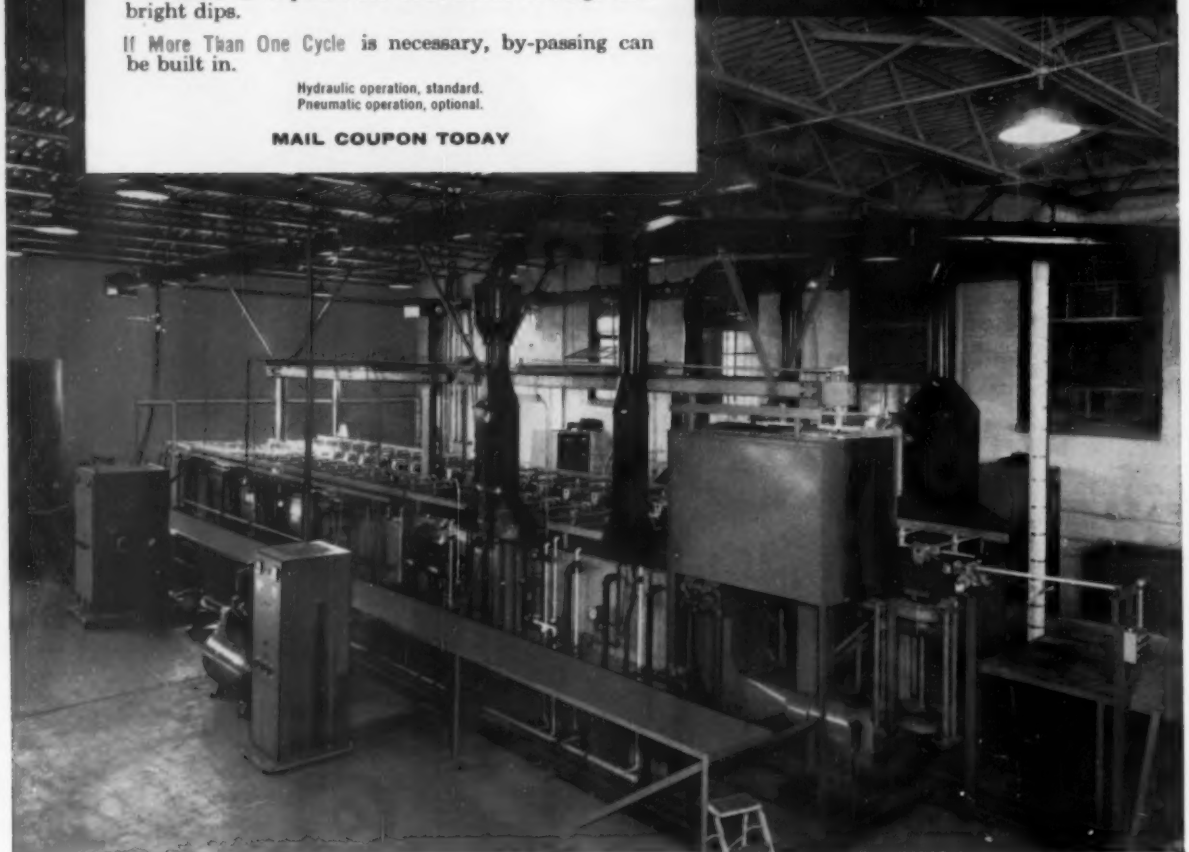

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YOU the advertiser, as a merchandiser channeling products to market for popularization and sale, are interested in any monthly magazine serving the electroplating, metal finishing and allied arts field for ONE reason and one reason ONLY, namely its demonstrable qualifications to bring the sales promotion story of YOUR products effectively to market. As an advertiser, YOU are interested in PLATING MAGAZINE, for instance, wholly for this purpose—and that's the basis upon which PLATING MAGAZINE is, in turn, interested in YOU the advertiser.[1]

That's why PLATING MAGAZINE has published the little booklet whose cover is pictured above—so that, from its illustrated, simply written pages, YOU the advertiser can glean all the information that you need to determine for yourself as to whether or not it is of DOLLARS and CENTS importance to YOUR company to employ PLATING's advertising columns, regularly and to maximum extent.

Copies of the booklet have issued, or will soon issue, to a large number of representative companies and their advertising agents, with whom PLATING MAGAZINE already enjoys a mutually esteemed relationship, or with whom PLATING desires to create such a relationship. If through some mischance, YOUR copy has not yet reached you, do please write us. (PLATING MAGAZINE, American Building, 443-445 Broad Street, Newark 2, N. J.)

Without obligation or cost to you of any sort, a copy will promptly be sent because, as said, the friendly primer was conceived, written and published by PLATING MAGAZINE exclusively to serve YOU the advertiser.

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Plating Begins at Once

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Lucite — Hard Rubber or Bakelite Cylinders
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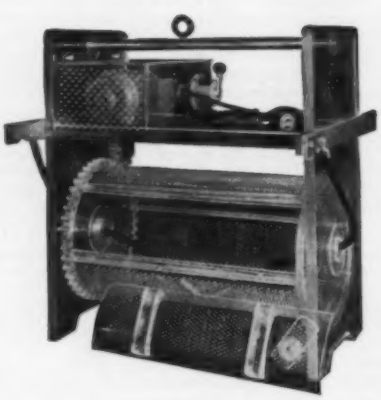
High power factor and low ripple.

6 to 48 volts D.C.

Basic-self-contained or with Remote Control.



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Built of extra heavy High Temperature Lucite for volume production and stability.

Cylinder: 10"x18" inside. Equipped with Reversing Switch to permit stopping and securing barrel for loading and/or unloading.

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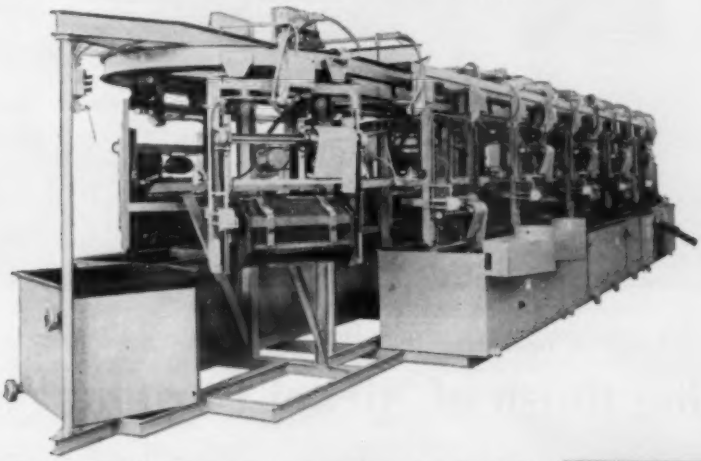
It pays to know what's new in barrel plating equipment . . . from economical, field-repairable cylinders . . . to high-production automatic machines.



THIS NEW UDYLITE CATALOG is packed with valuable information on the latest manual and automatic barrel plating equipment, designed and built by Udylite to help you boost your plating profit potential. Bring yourself up-to-date; write for your free copy today!

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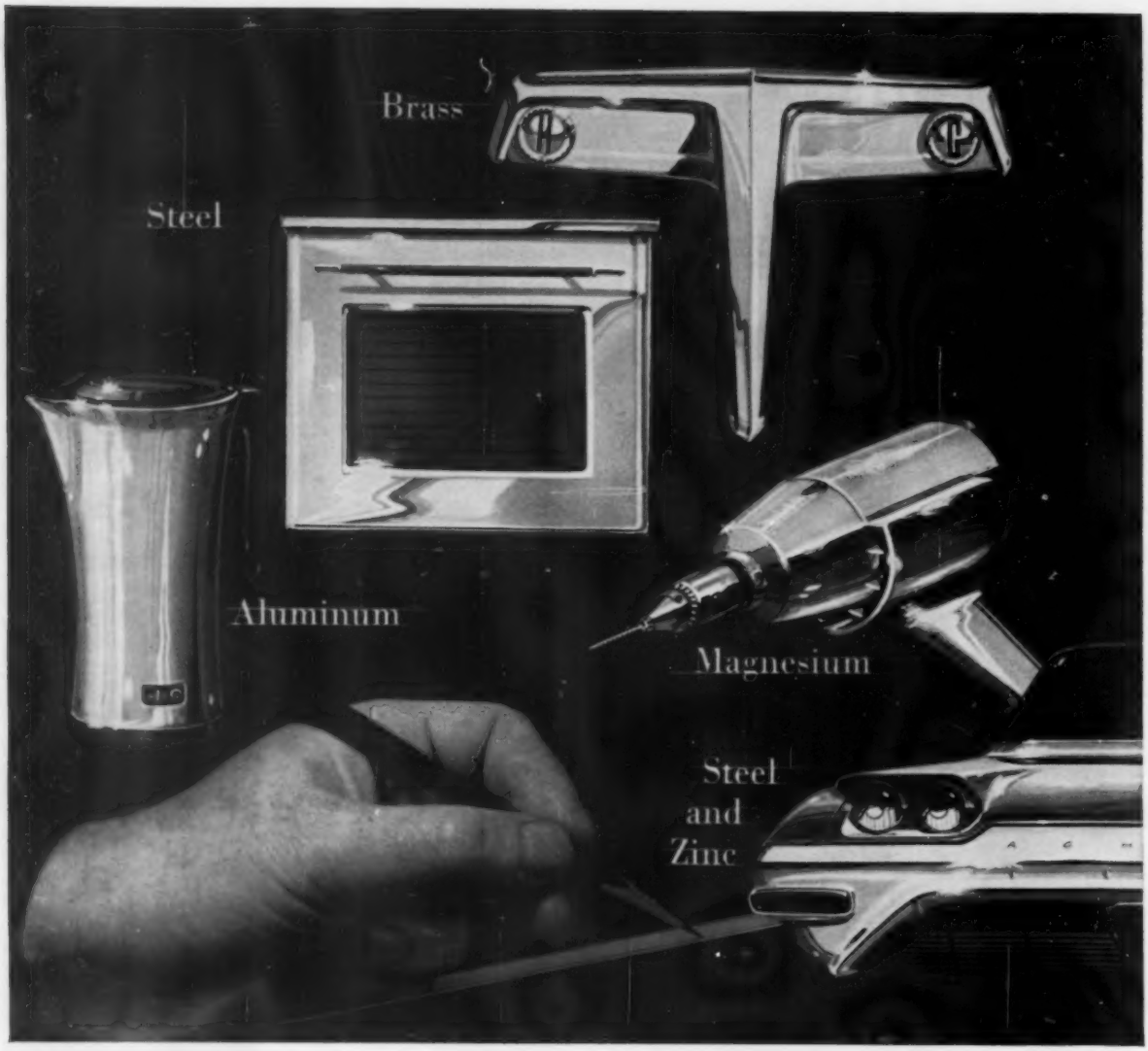

Choose any basis metal you desire and give it

a lustrous, lasting finish of Nickel-Chrome Plating!

Nickel-Chrome Plating provides a practical way to combine the beauty and protection of Nickel and chromium with the special properties of other metals:

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- strength of steel
- extrudability of aluminum
- lightness of magnesium
- conductivity of copper
- design flexibility of zinc-base die castings

Today's adaptable Nickel-Chrome Plating gives you the freedom to use a wide variety of basis materials to achieve the most desirable combination of performance, fabricability *and* practical cost.

Select the basis material that proves most suitable. Nickel-Chrome Plating will give it lustrous, matching beauty with brilliant blue-white color. Beauty with outstanding durability, too.

That's because Nickel-Chrome Plating not only provides shining sales appeal, but also protects basis metals from rust and corrosion. Protects basis materials from nicks and scratches. Makes the lustrous beauty lasting beauty.

So with Nickel in ample supply as far into the future as any man can foresee, there's no better time than now to use Nickel-Chrome Plating to your product's best advantage. Whether you want smoothing action, blue-white brilliance or satin tones—together with long-lasting protection—there's a Nickel coating to fit your requirements.

For information on accelerated corrosion testing of plated coatings, just drop us a card for your copy of "CORROSION TESTING OF ELECTRODEPOSITED COATINGS."

The International Nickel Company, Inc.
67 Wall Street INCO **New York 5, N.Y.**

Inco Nickel

Nickel makes plating perform better longer

from the Udylite supplies network you get . . .

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We check for Quality—experienced personnel avert costly errors by questioning the order. This goes on through the order department, the teletype network and the warehouse until your order is finally placed aboard carrier. Even then, if need be, it will be followed by our experienced traffic department clear to its destination.

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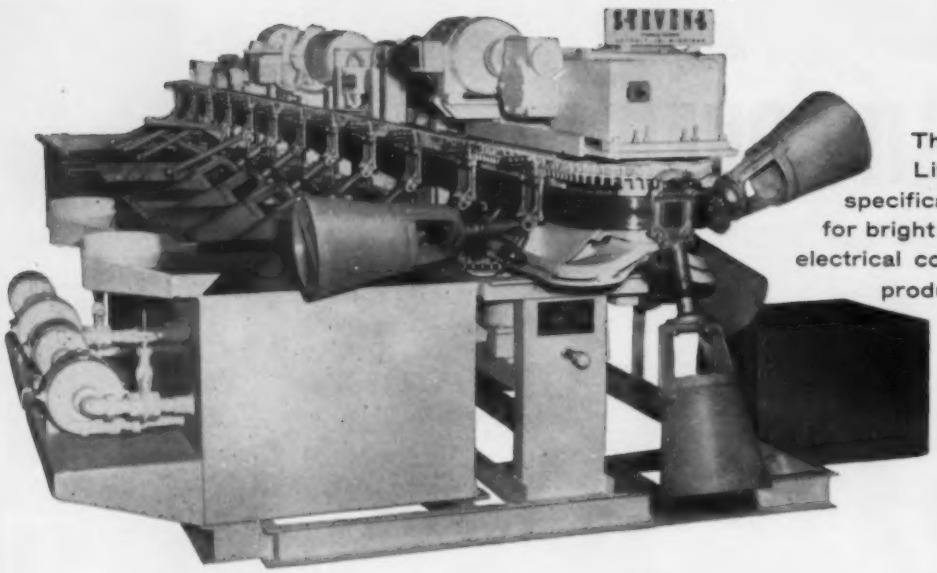


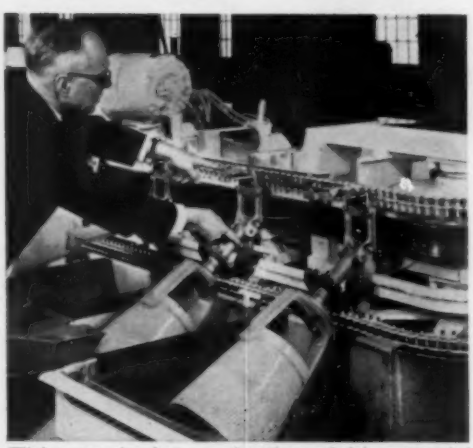
This particular Little Steve is specifically designed for bright dipping tiny electrical components at production speed.

NEW LITTLE STEVE BARREL MACHINE REVOLUTIONIZES PRECISION PLATING AND PROCESSING OF SMALL PARTS

Completely automatic, extremely compact, mechanically flexible, inexpensive to buy, install, maintain.

Meet the newest member of the famous Little Steve family of automatic plating and processing machines. It is small . . . only 4 feet high by 6 feet wide . . . not much higher or wider than your desk. Designed for use in your integrated operations, it incorporates features that meet today's rigid manufacturers' specifications. For example, this new Little Steve provides: • **precision plating on an automatic basis** • **low ceiling height and light floor load** • **designed for integrated process manufacturing** • **oblique barrels that require no lids** • **automatic loading and unloading** • **minimum solution and anode requirements.**

PLUS many more of the exclusive features that are part of every dependable, long-lasting, efficient Stevens plating and processing machine.



This exclusive selective "skip track" feature permits elimination or addition of any processing step. Note "no lid" barrels, easy accessibility of mechanism to operator standing on the floor.

Write today for complete information on this processing profit-builder.

frederic b. **STEVENS,** inc.

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)

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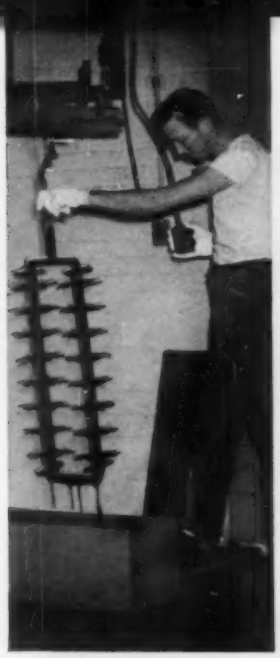
INDICATE A 810. ➤



THERE are many reasons why every one of the top dozen leaders in the business machine field uses racks protected by Coating 218X to plate working parts. The basic one is that this tough, resilient vinyl plastisol coating earns big savings on rack maintenance.

With more than a decade of experience behind it, Unichrome Coating 218X has had many opportunities to prove itself. It has survived thousands of cycles in severe plating service. In one application it lasted for six years in daily use without chipping, tearing or blistering. It's free-rising, inert. Should accidental damage occur, Coating 218X can be patched and rebaked with no loss of toughness.

See for yourself that in rack coatings, *using the best quality at the outset saves most money in the long run.* You can apply it yourself—or a nearby expert applicator will be happy to serve you. Write METAL & THERMIT CORPORATION, Rahway, New Jersey.

M&T **coatings and finishes**

METAL & THERMIT CORPORATION

In Canada: M&T Products of Canada, Ltd., Rexdale, Ontario

ALL OF THE 12 LEADERS IN THE BUSINESS MACHINE INDUSTRY

...coat plating racks with Unichrome Coating 218X!

Photo: courtesy of National Cash Register Co.

OUT-of-DATE or UP-to-DATE

how does your chrome plating stack up?

You can keep your chrome-plating process in step with today — with Diamond CPA 1800®.

This modern teammate for Diamond Chromic Acid increases plating speed and covering power. Allows a broader operating range. Simplifies anoding and produces a brighter, harder coating. Improves the metallurgical characteristics of chromium plate.

In short: Diamond CPA 1800 cuts your unit costs and saves you money. Diamond developed it. Your Diamond CPA 1800 Distributor can supply it where and when you need it.

For further information — call or write Diamond Alkali Company, 300 Union Commerce Building, Cleveland 14, Ohio.

Diamond Chemicals

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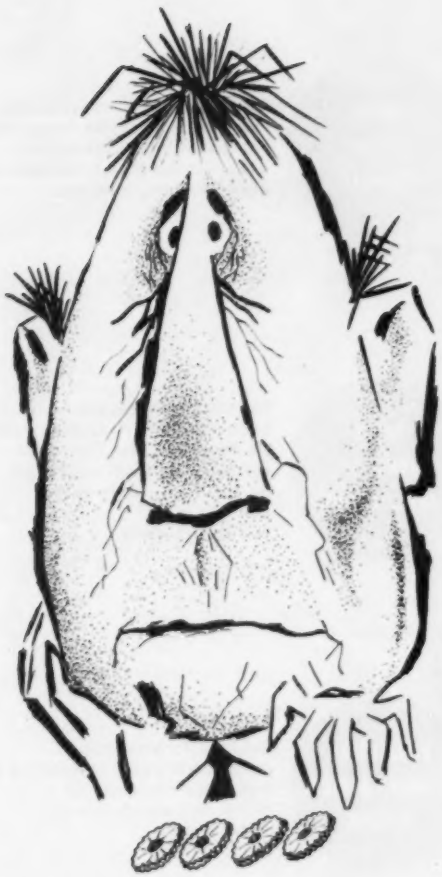
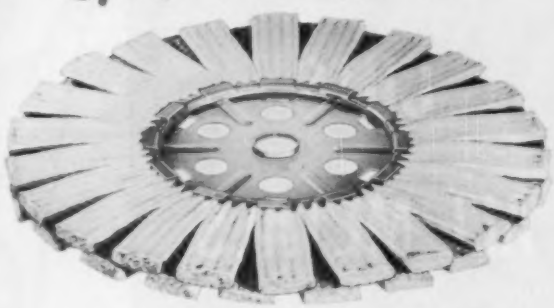


THERE WAS A YOUNG BUYER, NAMED MUFF, WHO BOUGHT ALL HIS PRODUCTS IN A HUFF. HE GOOFED AND HE FLOUNDERED FROM HIS BOSS HE WAS HOUNDERED, TILL HE TRIED USING GARFIELD BUFFS



FOR **CONTOUR WORK**
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SISAL UNIFLEX BUFFS

Flexible, strong and long-wearing, SISAL BUFFS are best for fast, heavy-duty cutting on hard metal with contoured surfaces. Construction is over-lapped for cool running, no streaking, unusual flexibility. Each individual buffing pad has an extra fold— to carry more compound on the leading edge for faster cutting with minimum buff wear.

CApital 6-7900

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BUFF CO.
62 CLINTON RD., CALDWELL, N. J.

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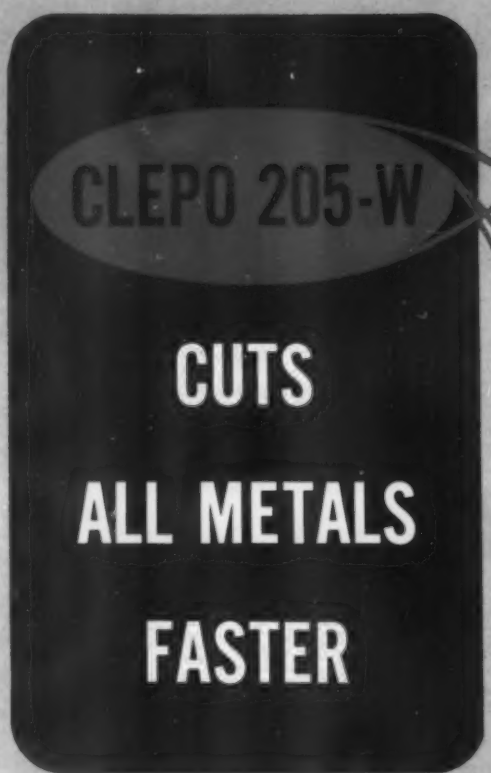

RAPID STOCK REMOVAL

CLEPO 205-W is an extremely fast-cutting abrasive deburring compound which produces a heavier cut than more commonly-used abrasive materials.

BROAD RANGE OF APPLICATIONS

CLEPO 205-W is used on such metals as hardened steel and Carboloy and also the softer metals. Excellent results can be obtained with metallic and non-metallic media and also self-rolling parts.

PROTECTION AGAINST CHEMICAL ATTACK

CLEPO 205-W contains compounds which protect the base metal against chemical attack and maintain a clean surface color.

CONTINUOUS CUTTING EFFECTIVENESS

CLEPO 205-W prevents the tumbling medium from being impregnated with metallic grindings. There is no coating build-up to slow the cutting action. The medium continues to cut with maximum effectiveness throughout the tumbling cycle.

Send for
Technical Bulletin 660

FG2-8

FREDERICK **GUMM** CHEMICAL COMPANY INC.
538 Forest Street, Kearny, N. J.

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GREETED by the President of the United States, the AES was welcomed to Michigan and Detroit by Governor G. Mennen Williams. The entire week of the AES's Convention, Exposition and International Conference was proclaimed by Detroit's Mayor as "AES GOLDEN JUBILEE WEEK IN DETROIT."

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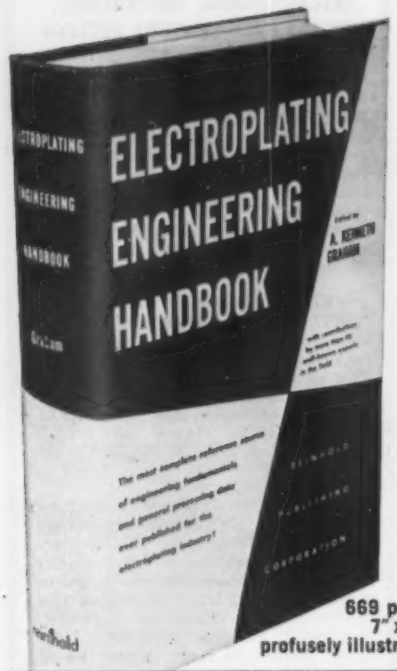

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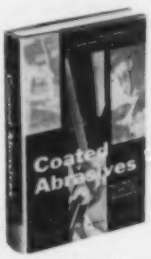

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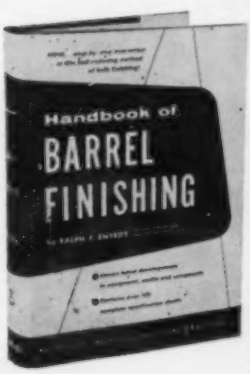

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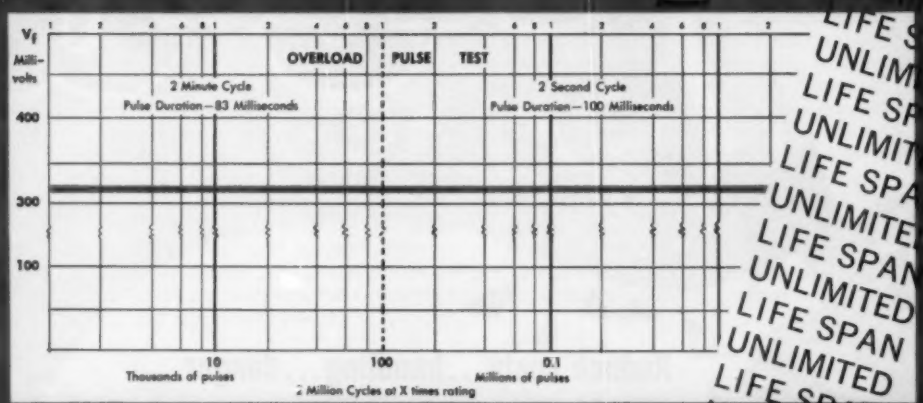

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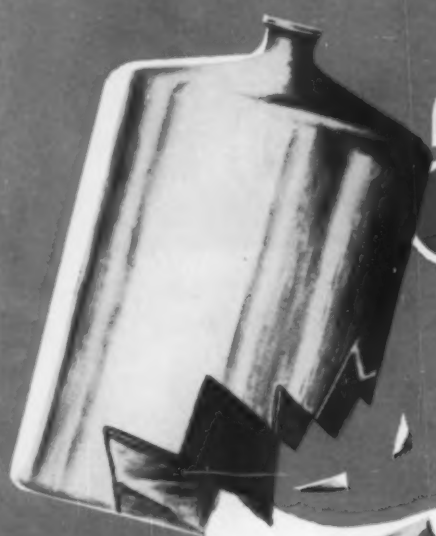

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SUPERIOR SEALING OF ANODIZED ALUMINUM AND ITS ALLOYS

by CHARLES C. COHN* and HARRY SOSSON**

ABSTRACT

Aluminum and aluminum alloys, anodized in sulfuric acid electrolytes, for decorative, functional and decorative architectural purposes, do not necessarily depend upon the thickness of the film for optimum corrosion and wear resistance.

Sealing decorative anodized films in hot water[2] does not materially improve corrosion resistance. Corrosion resistance of anodized films in the decorative thickness ranges unsealed, or hot-water sealed, compared to similar thickness films sealed by dual precipitation show material improvement when sealed by dual precipitation.[1] Corrosion resistance of thicker anodized films, in the decorative thickness range, unsealed or hot-water sealed, compared to thinner dual precipitation sealed films, show material improvement for films sealed by dual precipitation.

Thicker films of the decorative type, anodized and sealed by conventional methods[2] are quite soft at their outer surfaces,[3] compared to the hardness close to the aluminum interface. Thinner films are harder on their outside surfaces than thicker films. Thin or thick films in the decorative thickness range, if after-treated by dual precipitation[1] methods, with or without a subsequent hot water treatment, have greater corrosion and wear resistance, as well as better appearance, than hot-water sealed films. Thin or thick films may be treated to have high corrosion resistance to both outdoor environments and to alkali corrosion, without sacrifice of wear resistance and appearance, for either or both clear and colored films. Films treated for the specific purpose of alkali resistance generally have little salt spray resistance.[14, 20]

The anthraquinone dye test,[4] inconsistent in its results when the coat is hot-water sealed, becomes reliable and consistent with the dual precipitation seals.[1] Aluminum, chemically polished and anodized, shows consistent superior corrosion resistance, whether hot-water or dual precipitation sealed.

IN THE PRESENT STATE of the aluminum anodizing art, as practiced in the automotive, architectural and general decorative, and/or functional fields, film thicknesses vary from about 0.00008 to about 0.001 inches. Film thicknesses from about 0.00008 to about 0.0004 inches have been considered satisfactory for decorative and general wear resistance.

In the automotive field, anodized films vary in thickness from about 0.00008 to about 0.0004 inches.[5] The specification requirements for salt spray resistance are rather low,[6] because it is known that the conventional hot-water seal does not provide a high order of corrosion resistance for thin films. This inadequacy of hot-water sealed films has been reported by many versed in the art.

Wernick and Pinner[7] in their recent book on anodized aluminum state, "Hot-water sealing is not, in general, recommended for sealing porous coatings which have been produced by the sulfuric acid process, as corrosion spots are liable to develop."

Wernick and Pinner[8] further state in the same book, "The aluminum hydrate $Al_2O_3 . H_2O$ (created by hot-water sealing), is markedly softer than the oxide."

The reduction in coating hardness particularly at outside surface due to hot-water sealing is now generally recognized. Anodized coats are therefore limited to short time sealing, i.e., 10 to 15 minutes only, to create at least some corrosion resistance without softening the coat too much. Hot-water sealing provides little or no alkali corrosion resistance, which resistance is quite necessary against alkali detergents, car washes, mortar, plaster, concrete, cement, excelsior, wrappings, packings, asbestos, fiberglass, etc.[9, 22, 23]

Corrosion resistance as referred to in this paper, pertains mainly to the type of corrosion that takes place at the base of the pores or at breaks, or defects in the coat causing corrosion of the basis aluminum and creating white salts which show at the external or surface side of the coat. This is the type of corrosion that often affects tensile strength and elongation, and is the type referred to in government specifications.

Other types of corrosion, of lesser consideration are based on the corrosion of the external surface of the coat, which, if the corrosion has not penetrated through the pores, exhibits itself as a whitish uniform powder and not as powder spots.

Alkali corrosion on certain aluminum alloys sometimes has a tendency to stop due to the protective action of the corrosion product.[22] However, it does leave an etched effect[22] which cannot be cleaned off and which materially affects the appearance of the aluminum surfaces.

The dual precipitation seal[1] on anodized aluminum can prevent this.

HARDNESS OF ANODIC FILMS

It has been reported that the coating gets softer in a ratio of almost 50:1[10] as it grows outward from the metal/oxide interface with the greatest softness at the outside. This is due to the solvent effect on the older (outer) areas of the coat or film, by the electrolyte, during the formation of new film

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at the metal/oxide interface. Film hardness on the outside of the films of over 0.0003 in. which have been hot water sealed, have been reported to be insignificantly harder than the aluminum basis metal.

The hardest anodic films have a hardness on Moh's scale of between seven and nine, i.e., between that of quartz and corundum at the metal/oxide interface but are much softer on the outside.[11] The hardest films are obtained on pure aluminum or on aluminum alloys with a homogeneous structure. The hardness of the films is not uniform throughout their thickness.[11] The hardest, and also densest, are the areas adjoining the metal; the outer surface of the film has the lowest hardness and density. Tomashoff[11] has compared the scratch hardness values of aluminum oxide films and some other materials as follows:

Aluminum (polished surface)	80
Anodic oxide film	
Surface zone	140
Middle zone	3,000
Inner zone	5,000
Razor steel	1,500
Glass	2,000
Hardest chromium plate	3,100

HOT WATER DOES NOT THOROUGHLY SEAL

Dr. Spooner[12] of Aluminium Laboratories, Ltd., Kingston, Ontario, Canada, reports in his theories of sealing to the effect that a sulfuric acid anodized coat sealed in hot water partially narrows the diameter of the pore opening. It has also been reported that the hydrated portion of a hot-water sealed film is of small magnitude, and that it takes only slight abrasion to remove it and nullify its effect.

With pores that are not completely sealed by hot water,[27] it is therefore easy to see why hot-water sealed films do not resist, to any great degree, the entrance of corroding media through the pore to the basis aluminum at the base of the pore.

The art of precipitation of materials into the pore and adsorption into the coat is not new, per se, but the materials precipitated, considering their quantity, chemical character and the degree they are adsorbed on the aluminum oxide surfaces, have not been such as to enhance the properties of the film to any great degree. New sealing methods, the subject matter of this paper, had to be developed.

HARD ANODIZING[13]

It is, of course, possible to operate a sulfuric acid anodizing bath to form a thick, hard abrasion resistant film. In order to do this, it is necessary to control the electrolyte concentration, the electrolyte temperature and the anodizing conditions in such a manner, that it would be impossible to carry out the required anodizing conditions, and still remain within the proper economic realm of costs. At the same time, a film would be produced which would have little reflective or other decorative qualities. These are the results to be expected of anodizing under present architectural specifications.

PROJECT TO EVALUATE SEALING

A project was created to compare the corrosion and wear resistance of anodized aluminum sealed in hot water, with the corrosion and wear resistance of similar and other film thicknesses sealed by other methods including dual precipitation seals.

The evaluation was directed toward two major industries (automotive and extrusions), both large potential users of anodized aluminum. The results, of course, may be applicable to many other industries and to diverse applications.

The alloy No. 5357 was selected for the automotive industry because at that time it was indicated to be an ideal aluminum alloy for automobile trim.

The alloy No. 6063 was selected for the extrusion industry, since at that time it was already in wide use.

The alloy No. 2024-ST3 was also tested. The results were not shown in chart form for this report.

The test methods employed included accelerated salt spray corrosion tests, accelerated alkali corrosion tests, and actual outdoor exposure tests.

The salt spray test employed, was the copper acetic salt spray (CASS TEST).[14]

The alkali resistance test was based upon immersion in three per cent sodium hydroxide at room temperature.

The outdoor exposure tests included three types of environment: (a) Seashore—directly at water edge, (b) Industrial, (c) Rural.

As a correlating test, specimens were subjected to the neutral 20 per cent salt spray test,[20] and results correlated quite well with the CASS Test.[14]

DESCRIPTION OF TESTS AND EVALUATION OF TEST RESULTS[15]

Both accelerated tests and actual weathering tests were made to evaluate the corrosion resistance of the anodized aluminum panels. This was done in order to determine what correlation existed between them. It was found that corrosion of the anodized coats with relation to appearance correlated quite well.

Correlation of the effects of accelerated corrosion and weathering corrosion as to changes in physical and mechanical properties of the aluminum panels correlated in a general way. This seems to be due to the difference in protective value of the corrosion products generated at a high rate of speed in accelerated tests as compared to actual weathering tests. Alkali corrosion products, in general, seem to have a greater local protective effect than acid or chloride salt corrosion products. However, in acid, alkali or salt environments, whether or not the test be accelerated, the breakdown of the anodic coat bears a good correlation.

Penetration of the anodized coat, if not properly sealed, is a certain beginning for serious corrosion on the basis metal with the resultant deleterious effects on the physical and mechanical properties of the aluminum.

The copper acetic salt spray test (CASS Test)[14] was chosen as the accelerated salt spray test because:

1) It is a practical test for anodized aluminum, and comparative results are easily distinguishable.
2) It showed good correlation with the five per cent acetic acid salt spray test, the 20 per cent neutral salt spray test, and with outdoor exposure tests.
3) It is fast, accurate and duplicable.

Every four hours the panels were washed with clear flowing water to remove solid products. They were allowed to dry and then evaluated.

The system used to evaluate corrosion resistance was based on the amount of stain corrosion spots per unit of surface area.[28] A few scattered unstained fine pin points were not used as a basis of failure, since it was found that only corrosion spots with white stained areas resulted in loss of tensile strength and elongation. If pin points (without white corro-

sion) were so numerous or evident to affect the appearance of the film, it was, of course, rated as failure.

Evaluation of accelerated test results for salt spray and outdoor environment corrosion resistance, were based on standard methods for evaluating results of these tests.

A rating system with numbers from 0 to 10, with 10 as the most corrosion resistant, and 0 as the least (an unsealed coat), identify the comparative test results.

The alkali resistance test was based upon immersing the test panels in a fresh solution of three per cent (wt) of sodium hydroxide, at room temperature, for one minute, rinsing, drying and inspecting for clouding. This was repeated in one-half-minute testing intervals until clouding appeared, after which comparisons were made, with hot-water sealed panels.

The appearance evaluation was based upon the loss of reflectivity, or change in appearance with and without wiping, between anodized panels which have been subjected to corrosion tests, and anodized panels which have not been corrosion tested. Ratings were also based on a system of 0 to 10 as above.

The wear or abrasion resistance test was based on friction *after* subjection to a corrosion environment. This is more realistic than an abrasion test, without the corrosion factor.

It has been ascertained that the panels which show relatively poor corrosion resistance also have poor wear resistance, since the breakdown of the film by corrosion immediately affects the abrasion or wear resistance.

A method was established whereby corrosion tested panels were subjected to the heat and friction by pressure on a dry sewn cotton buff wheel at 5000 rpm peripheral speed. Panels with relatively poor corrosion resistance, and which exhibited local corrosion spots or areas, showed sizable areas of bare aluminum at these spots, while panels with good corrosion resistance showed complete resistance of the coat when buffed. A rating system of No. 0 to 10 was also used in evaluating these results.

THE RELATIONSHIP BETWEEN CORROSION RESISTANCE AND WEAR RESISTANCE

Anodized aluminum which is specifically designed for frictional purposes and resistance to penetration is referred to as hard anodizing. It involves a special set of anodizing conditions which could not be economically applied to decorative anodizing or even to architectural anodizing. The wear or abrasion resistance is based upon wear at specific bearing surfaces. The laboratory test for this type of abrasion resistance, which makes use of an abrasive stream or contact with an abrasion surface (Taber Abraser), might well be some measure of abrasion resistance of this type of coat. These coats or films are generally on the order of 0.001 to 0.004 inches or more in thickness. They are dark, unattractive and brittle, and have little or no reflective or decorative factors.

Decorative and certain functional anodizing, on the other hand, are concerned with a different type of abrasion or wear. The degree of abrasion or wear resistance with these coats is not concerned with a constant frictional bearing load, but with intermittent abrasion, such as pebbles, stones, grit and air-borne particles, and of greatest importance, the effect of the combination of such corrosion penetration and abrasion. In outdoor environments this combination is constantly present. When corrosion starts, it is usually observed as small pits. When a frictional load such as rubbing, is applied at these small pits, areas around the pits prove to be soft and powdery. Relatively large bare spots of exposed basis aluminum become evident around each pit. Therefore, the resistance of the film to wear is directly related to the corrosion resistance of the coat. Corrosion of the film itself leads to a powder and/or smut or bloom and shall be referred to later.

In actual tests involving aluminum anodized push-plates on doors, this is quickly observed when comparing plates which have been anodized and sealed in hot water, and those which have been anodized and sealed by dual precipitation. The perspiration of the hand that contacts the push plates, initiates corrosion comparatively quickly, and the removal of local areas of the coat follows it. On the properly sealed coat, under similar circumstances, this does not happen.

In certain architectural applications where cleaning maintenance is not practical, it has been customary to anodize with thick films 0.0008 to 0.001 in. With a properly sealed thinner coat that would supply the proper corrosion resistance, these thicker coats become unnecessary in many instances. Additionally, if desired, thinner coats can be much harder throughout, more reflective, and have a lower coefficient of friction on the outside surfaces due to lesser porosity on these surfaces.

Thin coats of the order of 0.0001 to 0.0003 in. sealed by dual precipitation,[1] have been in service in diverse environments for over 15 years in indoor and outdoor exposures and have exhibited little or no effects of corrosion, abrasion or wear. These outdoor environments included seashore, industrial and other areas in architectural and decorative applications.

Two groups of these long time exposure dual precipitation sealed anodized applications were identified:

(a) surfaces which were manually cleaned regularly,

(b) surfaces which were not cleaned at any time.

No substantial differences in the quality or condition of the anodized surfaces dual precipitation sealed were noted in the final evaluation, except for some loss of lustre by a loose film that is easily removed by wiping.

It will be noted that in the General Motors Standard for Anodic Coatings on Aluminum GM 4472-M June 1957,[5] thin films are specified as follows:

SALT SPRAY TEST—20 PER CENT NEUTRAL (ASTM-B117)

Code	Min Thickness (Inches)	Min Salt Spray Test (Hours) 20 Per Cent Neutral Spray
08	0.00008	24
10	0.00010	48
15	0.00015	72
20	0.00020	96
30	0.00030	144
40	0.00040	192

The following General Motors Standards apply to similar anodizing coat thickness, but salt-spray tested by the CASS Test[14] (Copper-acetic-acid—five per cent salt-spray):

GM Spec.	Anodizing Time	Coat Thickness (Inches)	CASS Tests Min Hours	CASS Tests Desired Hours
4407 P	08 min	0.00008	3	6
	10 min	0.00010	3	6
	15 min	0.00015	6	12
4263 P	20 min	0.00020	6	12
4273 P	30 min	0.00030	9	18
4261 P	40 min	0.00040	12	24

RESULTS OF TESTS[14]
(Salt Spray)
ALLOY NO. 5357

Film Thickness (Inches)	Hot Water Sealed			Single Precipitation Seal			Dual Precipitation Seal[1]		
	Corrosion	Appearance	Abrasion	Corrosion	Appearance	Abrasion	Corrosion	Appearance	Abrasion
0.0001	1	1	1	8	8	8	9	9	9
0.0002	2	2	2	9	9	9	10	10	10
0.0003	3	3	5	9	9	9	10	10	10
0.0005	7	7	5	9	9	9	10	10	10

Note: Rating of 10 indicates the best corrosion resistance, abrasion resistance and appearance, a rating of 0 the worst and 2, 3, 4, etc. in their order.

RESULTS OF TESTS[14]
(Salt Spray)
ALLOY NO. 6063-ST-5

Film Thickness (Inches)	Hot Water Sealed			Single Precipitation Seal			Dual Precipitation Seal[1]		
	Corrosion	Appearance	Abrasion	Corrosion	Appearance	Abrasion	Corrosion	Appearance	Abrasion
0.0001	1	1	1	8	8	8	8	8	8
0.0002	2	2	2	8	8	8	9	9	9
0.0003	3	3	4	8	8	8	9	9	9
0.0005	6	6	6	8	8	8	9	9	9

RESULTS OF OUTDOOR ENVIRONMENT TEST
RESULTS OF 3 YRS. EXPOSURE IN SEASHORE ATMOSPHERE AND SPRAY
ALLOY NO. 5357

0.0001	1	1	1	8	8	9	9	9	9
0.0002	2	2	2	9	9	9	10	10	10
0.0003	3	3	4	9	9	9	10	10	10
0.0005	6	6	4	9	9	9	10	10	10

ALLOY NO. 6063-ST-5

0.0001	1	1	1	8	8	8	9	9	9
0.0002	2	2	2	8	8	8	9	9	9
0.0003	3	3	4	8	8	8	9	9	9
0.0005	6	6	4	8	8	8	9	9	9

RESULTS OF 3 YRS. EXPOSURE IN INDUSTRIAL ATMOSPHERE
ALLOY NO. 5357

0.0001	1	1	1	8	8	8	9	9	9
0.0002	2	2	2	9	9	9	10	10	10
0.0003	3	3	4	9	9	9	10	10	10
0.0005	5	5	4	9	9	9	10	10	10

ALLOY NO. 6063-ST-5

0.0001	1	1	1	8	8	8	9	9	9
0.0002	2	2	2	9	9	9	10	10	10
0.0003	3	3	4	9	9	9	10	10	10
0.0005	5	5	4	9	9	9	10	10	10

Note: Rating of 10 indicates the best corrosion resistance, abrasion resistance and appearance, a rating of 0 the worst, and 2, 3, 4, etc. in their order.

At this point it is well to compare some typical results based on the CASS tests, using aluminum alloy No. 5357 in both cases.

DUAL PRECIPITATION SEALING

An anodizing time of 10 minutes was selected yielding a

coating thickness of 0.0001 inches and sealed by the dual precipitation method for 10 minutes.

At the end of *60 hours* in the CASS test the specimens were still perfect.

HOT WATER SEALING

On the hot water sealed panels the results were as follows:

Anodizing Time	Coating Thickness	Time Hot Water Sealed (Distilled) at pH 6.0	CASS Test Results
5 min	0.00005	5 min	4 hr
10 min	0.0001	10 min	5 hr
20 min	0.0002	15 min	10 hr

The 10-minute anodized dual precipitation sealed panels, still satisfactory at 60 hours, were 12 times better than the 10-minute anodized hot-water sealed panels, and six times better than the 20-minute anodized, hot-water sealed panels.

The 5-, 10- and 20-minute anodized panels, dual precipitation sealed withstood the three per cent sodium hydroxide (caustic soda) much better than any of the hot-water sealed panels (anodized from 8 to 40 minutes).

ANODIZING CONDITIONS

Anodizing film thickness were chosen as 0.0001, 0.0002, 0.0003 and 0.0005 inches.

One set of these panels was sealed in hot water in accordance with standard procedures.

A second set of panels was sealed by a single precipitation method.

A third set was treated by the dual precipitation seal to render both salt spray and alkali resistance.

Two specimens were used for each test, and two blanks untested were retained as standards for comparison.

These accelerated tests were duplicated three times.

All specimens were anodized under the following conditions:

CURRENT—Direct
ELECTROLYTE—15 per cent (wt) of 66Bé Sulfuric Acid
TEMPERATURE—70F
TIME—to create thicknesses of film desired
CURRENT DENSITY—12 amperes per square foot
AGITATION—Air

Hot-water sealed panels were sealed in de-ionized water at 210F at a *p*H of 6.0.[15]

Panels treated by the dual precipitation seals were first anodized in sulfuric acid in the conventional manner. Then, after rinsing, the panels were again anodized for one minute at five volts in a dilute solution of chromic acid at room temperature.[16] Those panels treated for salt spray, but not for alkali resistance, were then treated in a bath which precipitates inorganic insoluble materials into the pores of the film. Those panels created for regular corrosion resistance as well as alkali resistance were anodized as above, then treated to precipitate an inorganic insoluble material into the pores of the film, and then chemically treated to resist attack by alkali (the dual precipitation seal).[1]

METHODS OF EVALUATION

The duration of time of accelerated salt spray tests (CASS Test)[14] was based on the time it took toward initial breakdown for the various panels.

Since the water-sealed panels failed first, they were re-

RESULTS OF THREE YEARS EXPOSURE IN RURAL ATMOSPHERE

Film Thickness (Inches)	Hot Water Sealed			Single Precipitation Seal			Dual Precipitation Seal[1]		
	Corrosion	Appearance	Abrasion	Corrosion	Appearance	Abrasion	Corrosion	Appearance	Abrasion
ALLOY NO. 5357									
0.0001	2	2	2	10	10	10	10	10	10
0.0002	3	3	3	10	10	10	10	10	10
0.0003	4	4	5	10	10	10	10	10	10
0.0005	7	7	6	10	10	10	10	10	10
ALLOY NO. 6063-ST-5									
0.0001	2	2	2	10	10	10	10	10	10
0.0002	3	3	3	10	10	10	10	10	10
0.0003	4	4	5	10	10	10	10	10	10
0.0005	7	7	6	10	10	10	10	10	10

RESULTS OF IMMERSION IN THREE PER CENT SODIUM HYDROXIDE AT 75F

ALLOY NO. 5357									
0.0001	1	1	1	3	3	4	10	9	9
0.0003	1	1	1	3	3	4	10	9	9
0.0003	1	1	1	3	3	4	10	9	9
0.0005	1	1	1	3	3	4	10	9	9
ALLOY NO. 6063-ST-5									
0.0001	1	1	1	3	3	4	10	9	9
0.0002	1	1	1	3	3	4	10	9	9
0.0003	1	1	1	3	3	4	10	9	9
0.0005	1	1	1	3	3	4	10	9	9

Note: A rating of 10 indicates the best corrosion resistance, abrasion resistance, and appearance, a rating of 0 the worst and 2, 3, 4, etc. in their order.

moved at failure, and the dual precipitation sealed panels were allowed to remain in the salt-spray until their breakdown.

All of these panels dual-precipitation-sealed ran over 60 hours in the CASS Test.[14]

The outdoor exposure tests were all of a given duration of time.

The alkali resistance tests were based on the time of first failure. Since in all cases, the hot water sealed panels failed long before the other treated panels, the other treated panels were exposed to the alkali test for a much greater length of time. The evidence of failure in the alkali test was the time required for the first sign of film clouding.

DOUBLE ANODIZING AND THE DUAL PRECIPITATION SEALS

The results of the foregoing tests and the discussion prior thereto include three after-treatments which follow the anodizing. They are:

(1) Chromic Acid Anodizing[16] for one minute at low voltage in a dilute solution of chromic acid at room temperature. This is designed to impart increased salt spray resistance even without any seal (see drawing). However, it leaves the coat in a stainable condition and the pores therefore should be further treated as by sealing.

This chromic acid anodizing step may be omitted or it may be used in conjunction with one or both precipitation seals.

(2) The first precipitation seal may be used alone to impart increased salt spray resistance, with or without the chromic acid anodizing step or without the final precipitation seal for alkali resistance.

(3) The second precipitation seal for alkali resistance should not be used alone. It can be used following the steps of chromic acid anodizing and the first precipitation seal, or after the first precipitation step without the chromic acid. It not only imparts alkali resistance but materially increases salt spray and outdoor environmental resistance to clear or colored coats.

The principle underlying the chromic acid anodizing step[16] is to impart corrosion resistance to an anodized film by forming a corrosion resistant extremely dense thin invisible layer at the base of the pore and possibly to adsorb small amounts of chromium ions on the film particles. In the art of producing chromate conversion coats on aluminum, it is known that these films exhibit an unusual degree of corrosion resistance. The very thin dense layers that they form of oxy-chromates or oxy-dichromates, etc., seems to be the basis of their high corrosion resistance. This may in fact take place to some extent in the second anodizing stage wherein a one minute anodizing step in a dilute solution of chromic acid, is performed. While this method increases the corrosion resistance of the film considerably, the pore is still open above this thin protective film. It can be dyed at this point, or, if a clear film is desired, it may be sealed in the conventional manner, with hot water, to prevent staining.

However, since the hot water seal has its limitations, one or two precipitation seals[1] are suggested, for clear or dyed work, wherein the pore gets almost fully plugged with a clear stable material. While[17] nickel acetate or other hydrolysable salts may be used for this seal, they have the disadvantage of creating an undesirable loose film or smut on the surfaces (which requires wiping or buffing), and which do not add enough to the corrosion resistance of an ordinary anodized film.

Therefore, the second precipitation seal is applied to increase alkali and salt-spray resistance in addition to the regular (salt spray) corrosion resistance. This comprises a short time immersion in an aqueous solution of selected composition for a few minutes at preferably elevated temperature.

COATING DENSITY OR WEIGHT PER SQUARE FOOT OF SURFACE AREA

Ranges of coating weight per sq ft of surface area have, in previous specifications, been a requirement. Coating weights from about 600 to 2500 mg/sq ft of surface area have been indicated.

The necessity of coating weight specification is understandable to obtain the thicker coats that are necessary if the hot water is employed to obtain as much corrosion resistance as can be attained this way.

Since the greater unit of coating weight per sq ft is indicative of the dense structure of the coat, and since the hot water seal is more effective on the denser types of coatings, the rule of high coating weights has been necessary.

In order to achieve dense coatings for thick coats, one of the essential requirements is to keep the anodizing electrolyte at a low temperature in order to minimize the etch-back effect of the electrolyte and the porosity effect on the coat during the long period of anodizing time. This mechanism of low temperature is a basic reason for the production of the so called hard coats.

Since practically all the coats of commerce, except the hard coat and those of certain architectural specifications are within the range of about 0.0001 to about 0.00045 in., it would be a simple factor in anodizing specifications to designate ranges of anodizing time, temperature, electrolyte temperature and current density to achieve these results.

Also, since the use of precipitation seals, unlike hot-water seals, do not require (but are not limited to) coats of over 0.0002 in. for achieving ultimate corrosion and wear resistance for most uses, the specification should not require the thicker coats. Time savings as well as additional coat luster would be achieved, aside from the great increase in corrosion resistance.

Hot-water seals with reference to corrosion resistance on coatings over, say 0.0003 in. (20 minute anodizing), start to become inefficient, since the porosity of the coat over this thickness becomes a factor, making it difficult to seal porous coats effectively. For this reason it is a wrong premise to rate high corrosion on the basis of thickness. This is the reason that hard anodizing requires very low temperatures for its thick coats (0.0008 in. and up). In order to achieve this, tremendous refrigeration for cooling is required and this is not practical for the realm of conventional anodizing (below the hard coat range) from a standpoint of costs and anodizing time, and very high power requirements.

Mason[25] in his paper on "Density and Porosity of Anodic Coatings on Aluminum," on page 57, Table I, shows that the density of a two-minute anodized coat, sealed with hot water is greater than a 30-minute coat similarly sealed.

He also shows, that the percentage of pore volume in a two-minute anodized coat is much less than in a 30-minute anodized coat. This points up the factor of increasing porosity with anodizing time and the greater difficulty of properly sealing with hot water.

The diverse needs of industry, and the increased use of aluminum requires not only protection against outdoor environments of salt, soot, acids, etc., but also against alkali media such as plaster, cement, paper, detergents, car washes, dish washers, excelsior, asbestos, fiberglass, etc.[9, 22, 23]

In the automotive field, those aluminum parts which are subject to outdoor environment need resistance to salt-spray, industrial atmospheres, organic acids, as well as to alkali detergents, common to car washes. No single seal of the prior art (for anodized aluminum) has been known to have resistance to this diverse range of corroding media.

In the hot water sealing technique it was customary to anodize with thick films to attain a measure of salt spray resistance (without alkali resistance). Thick coats are costly, slow down production, reduce reflectivity and sacrifice hardness of the exterior of the coat.

A relatively thin film (coat), when created and sealed by the dual precipitation[1] method described herein, would have the following advantages:

(1) Economies of short-time anodizing,
(2) Resistance to salt spray, industrial atmospheres, organic acids (decayed vegetation and insects), and alkalis,
(3) Retention of reflectivity,
(4) Retention of hardness of outside of coat.

In the architectural field these same factors apply. In this field, alkali resistance as well as weather resistance, is a major factor. Alkali corrosion is generated by mortar, cement or plaster,[9, 22] either by direct contact or by remote effect when rain water carries the leached alkalis from adjacent or remote mortar or cement to the anodized aluminum windows, frames, etc.

In both the automotive and architectural fields as well as in other fields where aluminum is exposed to the weather, there is another factor to be considered.

Aluminum that has been anodized and hot-water sealed conventionally, whether reflective or non-reflective, has a tendency to lose its metallic lustre and take on a dull gray, milky appearance. This may take a permanent form or a wipeable smut due to the corrosion of the outside of the coat. It becomes easily soiled since it has lost its sealing effect and the coating becomes subject to finger marks and stains, and is almost impossible to clean properly without further damaging the anodized coat.

It is therefore important that proper sealing be specified to overcome the described effects.

PENETRATION OF THE ANODIZED COAT

In the architectural field, in the use of curtain walls, windows, etc., there are certain major corrosion inducing factors, i.e., small particle abrasion, atmospheric corrosion and galvanic cell corrosion induced by particles of organic matter, soots, and heavy metals attaching themselves to the anodized surfaces. When coats of 0.0008 to 0.001 in. are specified, they are often used, with or without a seal. Thinner coats, say up to 0.0005 in. have also been specified but these thinner coats must be hot water sealed. The sealing efficiency of the hot water sealed thinner coats is not good enough to prevent corrosion. The corrosion resistance of the thin hot-water-sealed film is soon nullified by the grit and foreign matter abrading the surfaces, exposing the pore areas and creating local corrosion cells.

By contrast, this same type of abrasion and settling of organic matter or heavy metal particles on thinner anodized surfaces which have been dual precipitation sealed, do not cause these corrosion effects. The entire pore area is plugged (there are billions of pores per square inch) and since corrosion is based on attack on the bare aluminum at the pore-base, it cannot get a start. Coats much thinner than 0.0008 or 0.001 in. can be used provided they are double precipitation sealed. These thinner coats have better appearance, more flexibility and are certainly much less costly to produce, while they maintain corrosion and wear resistance.

In the automotive field, thin coats, properly sealed, could be used on almost any application. A condition exists in the automotive field that is different from the architectural field. This concerns anodized aluminum on parts of a car close to the ground wherein the parts may be subject to the impact and penetration of pebbles, sharp stones, etc.

If an object, such as a sharp stone of sufficient weight and velocity is impacted against a surface of anodized aluminum even at 0.0008- to 0.001-in. thick, it would penetrate the coat and create local corrosion areas. A hot-water sealed coat, when affected this way, soon spreads the corrosion to adjacent areas near the pore base since anodized aluminum has no self-healing properties.

On the other hand, a coat, thick or thin, which has been dual precipitation sealed,[1] when subjected to a similar coat-break by a sharp stone, does not encounter this creeping corrosion, since the pores of the surfaces adjacent to the break are plugged and the adjacent oxide is highly corrosion resistant.

While dual-precipitation-sealed anodized coats do not have the self healing action of adsorbed chromate, they do have the property of arresting progressive corrosion, which the hot-water-sealed film does not have.

In both the automotive and architectural fields, as well as in others, hot water sealed films, after certain exposure to weather conditions have the property of losing their luster, becoming chalky, and adsorbing stains and dirt. They become difficult to wash or clean to a uniform finish.

On the other hand, films sealed by dual precipitation,[1] may appear to whiten over a long period of time, but the whitening consists of a loose outerfilm which can be washed or wiped off to disclose a high degree of remaining reflectivity, uniformity and cleanliness.

THE ANTHRAQUINONE DYE TEST[4]

This test has proved itself inconsistent on hot water sealed anodized coats. The inconsistencies[30] were found to be due to the changing characteristics of the coat after hot-water sealing, sometimes resisting the dye immediately after sealing, accepting the dye days after the seal and again resisting the dye at a later date.

While the dye test was not considered a measure of corrosion resistance directly, it was related to sealing which in turn was related to corrosion resistance.

When anodized coats are sealed by the dual precipitation[1] method heretofore described, the dye test[4] becomes positive and consistent and is properly related to the corrosion resistance of outdoor environments.

The dual precipitation seal for both salt spray[14, 28] and alkali resistance, being short time sealants do not tend to soften the anodized coat such as happens with prolonged sealing treatment in hot water. Also, the seal is not easily broken as by light abrasion or dry heat. Further, the opti-

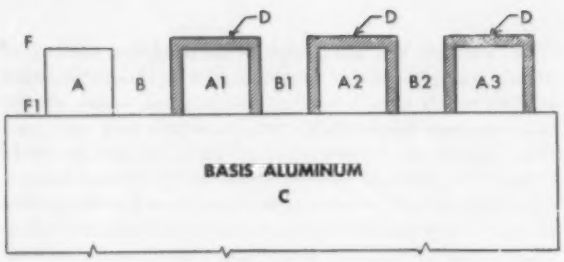

Fig. 1

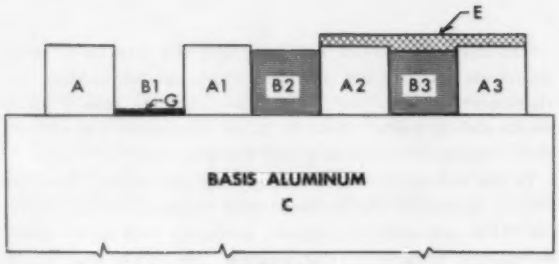

Fig. 2

mum continued appearance of the original finish is a desirable factor in contrast with the clouding or chalking of the hot water sealed film.

EXPLANATION AND GRAPHIC MECHANISM OF AFTER-TREATMENTS

An anodized coat is composed of billions of particles of alumina (Al_2O_3) interspersed with billions of pores per square inch of coating. Dyeing or coloring of this coat is not based on filling the pore with dyestuff, but rather on adsorbing the dye[19] on the aluminum oxide particles, or by internal reactions such as hydrogen bonding, chelating and other mechanisms.

Figure 1 is a cross section of a piece of anodized aluminum (not drawn to scale). Letters A, A1, A2 and A3 represent, for illustration only, the oxide coat (particles of oxide). Letters B, B1 and B2 represent the pores and the letter C represents the basis aluminum. The letter D represents the growth of the oxide particles of the coat, due to hot water sealing. The partial growth narrows the diameter of the pore B1 somewhat. The letters F–F1 represent the depth or thickness of the oxide coat (before sealing).

The pore diameter in anodized coats is estimated to be about 0.015 micron (0.000000590 in.) before sealing in hot water. These pores cannot be seen by the naked eye. In ordinary hot water sealing, due to swelling of the oxide particles,[12] the pore diameter is theoretically decreased to a degree, leaving a large enough pore diameter to retain or adsorb corrosive materials from the environment or from accelerated testing. This is the reason why hot-water sealed coats are not rated very high in salt-spray or in corrosive environmental resistance.[21] Nor are these types of sealed coats resistant to alkali corrosion. The pores, because of their capillary-like structure, often retain corrosive media because of difficulty of washing them out.

Three new and efficient types of after-treatment (seals) of the coat are now available as previously described. The first is based on a secondary anodizing step for one minute at low voltage,[10] and at low current density in a dilute solution of chromic acid.

Referring to Fig. 2, the mechanism and effect of this treatment is believed to be as follows:

A thin invisible high density film is formed at the base of the pore (at G). This film is believed to block corrosion in the same manner that a very thin chromate conversion film protects aluminum surfaces by the formation of complex chromates. Also colorless adsorption may take place on the oxide coat itself. In any case the corrosion resistance is materially increased.

At this point, the coat may be dyed or after-treated as a clear coat and then sealed. Instead of the customary hot water seal, it has been found preferable to plug the pore instead of only swelling the oxide coat (as in the hot water seal).

The plugging of the pore (Refer to Fig. 2), is done with an inorganic colorless highly corrosion resistant material, which is also adsorbed on the oxide coat. It can be employed over a clear coat or over a dyed or colored coat. It not only considerably increases the corrosion resistance (without softening the coat), but presents a smooth bright coat which needs no after-buffing or rubbing. It is effective on a thin coat (0.00008 in.) or on a thick coat (0.0008 in.), or of course on coats of intermediate thickness.

A final after-treatment in another special dilute aqueous solution results not only in a high corrosion resistant coating to the well known corrosion environments, but also to alkalis, such as found in architectural applications, detergents, car washes, paper wrappings, excelsior, etc.

Again referring to Fig. 2, the letter G represents the indicated dense film caused by the chromic acid anodizing procedure, at the base of pore (B1). B2 and B3 represents the clear precipitation products plugging the pore as accomplished by the first precipitation seal over a clear or colored coat. E represents the clear precipitation products completely plugging the pore and leaving a film overlaying the entire oxide coat (the second precipitation seal).

AN ACCELERATED COMPARATIVE ALKALI RESISTANCE TEST

Specimens

(a) Aluminum test panels are anodized in regular conventional manner, and hot water sealed.

(b) Duplicate anodized test panels are:

(1) Anodized in chromic acid (U. S. 2,558,400).

(2) Sealed with the first precipitation seal.

(3) Sealed with a second precipitation seal b1, b2 and b3, or b2 alone, or b2 and b3 may be employed.

Test Procedure

Simultaneously partially immerse test panels a and b in a glass beaker containing a three per cent solution of caustic soda, (sodium hydroxide) at room temperature at one minute intervals.

Visually observe which test clouds first, after drying at each interval.

Generally it will be found that the conventionally anodized and hot-water sealed specimen will be attacked first, indicating prior failure.

ACCELERATED COMPARATIVE SALT SPRAY TEST

Using aluminum test panels similarly prepared, it is suggested that these be tested comparatively, in any one or all four of the standard tests, under controlled conditions (GM CASS Test;[14] Government 20 Per Cent Salt Test;[20] 5 Per Cent Acetic; and 5 Per cent Neutral Test),[21] and note panels which fail first.

Those panels which excel in the tests in BOTH the alkali

and acid media, should obviously be declared superior over those which failed first in either or both tests, and are therefore indicative of better corrosion resistance in outdoor exposures.

PRIOR CHEMICAL POLISHING CORROSION RESISTANCE

It has been satisfactorily demonstrated[29] that chemically or electrochemically polished aluminum (and its alloys) which is subsequently anodized, has much better corrosion resistance than unpolished or mechanically polished and anodized aluminum.

This may be accounted for by the smoothing effect of chemical polishing, wherein the corrosion voltage potential difference is lowered by removal of micro metallic peaks from the aluminum surfaces.

THE FUTURE OF ANODIZED ALUMINUM

Nathaniel Hall, editor of *Metal Finishing*, on page 41, of the January 1960 issue, in his editorial titled, "The Outlook for 1960," writes regarding the use of aluminum in the automobile industry: "the remaining obstacles appear to be inferior luster and durability of the anodic coatings, and the practice in automatic car wash stations of using harsh steam cleaners."

Definite progress has already been made to overcome each one of these obstacles, as follows:

(1) Increased mirror luster by a modification of the bright dip technique.

(2) Maintaining reflectivity by use of the dual precipitation seals.

(3) Durability of the anodic coatings by increasing corrosion and wear resistance—making use of the dual precipitation seals.[1]

(4) Resistance to corrosion caused by the practices in automatic car wash stations using harsh (alkali) steam cleaners—making use of the dual precipitation seals (patents pending).

These needed improvements apply beyond the automotive field to practically any use wherein anodized aluminum is desirable for durability, corrosion resistance, light weight, beauty, color, insulation and economies.

ADDENDA

Continuing tests using alloys Nos. 5457 and 6463, correlate quite well with results obtained with alloys Nos. 5357 and 6063.

Tests on alloy 2024-ST with coating thicknesses based on as little as 120 ampere minutes per square foot of surface area of aluminum, and sealed by the dual precipitation method, show a corrosion resistance to the CASS Test[14] of 60 hours compared to the hot water seal of only 8 hours and the dichromate seal of 16 hours.

The statements made in this writing have been assembled from test data performed over a long period of time, and are believed to be reliable and dependable.

They are set forth here in good faith in an academic manner, with a feeling that these findings may be helpful to the aluminum industry as a whole, and to aluminum anodizers in particular.

Because of limitations in the art as for example, variances in testing procedures, equipment differences, and other factors like complete agreement in evaluation standards, the authors cannot assume responsibility for data reported except as related to the actual results reported by them.

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PROGRESS TOWARD THE DEVELOPMENT OF A NONEMBRITTLING CADMIUM ELECTROPLATING PROCESS

IV. Use of Methanol as a Solvent In Cadmium Plating Solutions

Fourth in a Series of Papers

by S. W. STRAUSS and P. N. VLANNES*

ABSTRACT

Noncyanide baths containing methanol or methanol plus triethanolamine were investigated over a wide range of composition for their characteristics in plating cadmium on ultra-high-strength steel. Plating evaluation included Hull-cell tests, throwing power and current efficiency determinations, embrittlement characteristics, and bath life in continuous plating. Results of delayed fracture tests indicate that the methanol and methanol-triethanolamine baths are nonembrittling.

INTRODUCTION

POSSIBLE APPROACHES toward the development of a nonembrittling cadmium electroplating process include (a) the development of aqueous baths which are fundamentally different from the cyanide bath and (b) the development of nonaqueous baths. Previously, the application of (a) resulted in the development of an embrittlement-free bath.[1] The present paper gives results obtained via approach (b) in which methanol was used as a solvent for the cadmium salt.

SCREENING EXPERIMENTS

The method used for a preliminary evaluation of the numerous organic compounds which could conceivably act as suitable solvents for cadmium salts was essentially the same as that reported in an earlier paper in this series.[2] From a large number of possible organic solvents such as heterocyclic compounds, glycols, glycol ethers, alcohols, amines, aldehydes, and ketones, methanol was one of the solvents that appeared from the results of initial screening tests to justify further study. Additional exploratory experiments were performed in which plating was conducted at temperatures from about —40C to the boiling points of the methanol solutions containing cadmium acetate or a halide of cadmium. Excellent deposits were obtained at about 0°C or lower. At temperatures higher than about 30C, dark poorly-adherent deposits resulted. It was found that the addition of triethanolamine (TEA) to the methanol bath increased the covering power of the bath.

CURRENT DENSITY CHARACTERISTICS

Cadmium-Methanol Solutions (M):

The Hull-cell method was used to obtain current density characteristics.[2,3] The data in Fig. 1 indicate that the best plating latitude is obtained by using methanol solutions which contain about 0.9—1.35 M/l of cadmium acetate. In general, similar results were obtained when copper cathodes were used instead of steel cathodes.

The effect upon plating characteristics produced by adding each of the following materials to the bath was investigated: 1 g/l of various inorganic salts (Fig. 2), 10 ml/l of organic liquids (Fig. 3), and water (Figs. 4–6). Figures 2 and 3 indicate that, in general, the inorganic and organic additives did not increase the plating latitude to any appreciable extent. However, the addition of copper salts, zirconium salts, aluminum sulfocarbolate, triethanolamine, quinoline, and isoquinoline did improve the appearance of the deposit. Figure 4 shows that methanol solutions can contain as much as 50 volume-per cent of water without seriously altering the

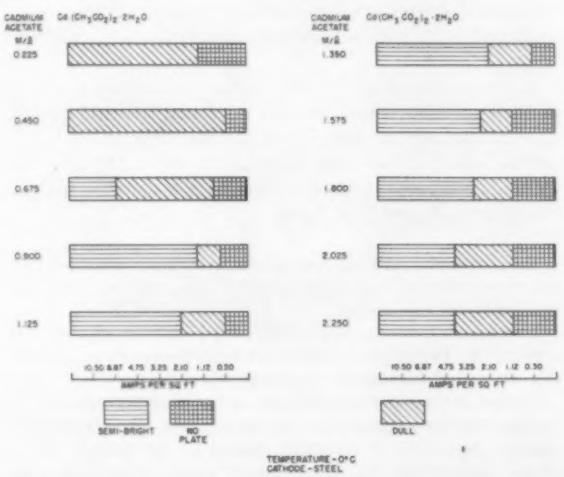

Fig. 1. Hull cell data for the cadmium-methanol solutions.

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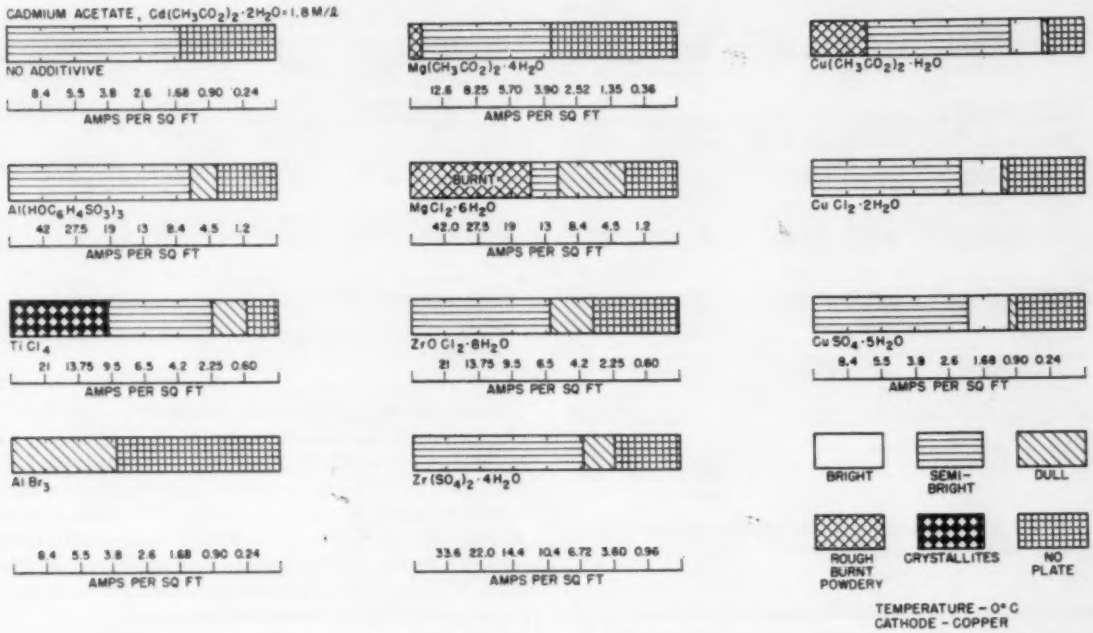
CADMIUM ACETATE, $Cd(CH_3CO_2)_2 \cdot 2H_2O$ = 1.8 M/L
NO ADDITIVE
8.4 5.5 3.8 2.6 1.68 0.90 0.24
AMPS PER SQ FT
$Mg(CH_3CO_2)_2 \cdot 4H_2O$
12.6 8.25 5.70 3.90 2.52 1.35 0.36
AMPS PER SQ FT
$Cu(CH_3CO_2)_2 \cdot H_2O$
$Al(HOC_6H_4SO_3)_3$
42 27.5 19 13 8.4 4.5 1.2
AMPS PER SQ FT
BURNT
$MgCl_2 \cdot 6H_2O$
42.0 27.5 19 13 8.4 4.5 1.2
AMPS PER SQ FT
$Cu Cl_2 \cdot 2H_2O$
$Ti Cl_4$
21 13.75 9.5 6.5 4.2 2.25 0.60
AMPS PER SQ FT
$ZrO Cl_2 \cdot 8H_2O$
21 13.75 9.5 6.5 4.2 2.25 0.60
AMPS PER SQ FT
$Cu SO_4 \cdot 5H_2O$
8.4 5.5 3.8 2.6 1.68 0.90 0.24
AMPS PER SQ FT
$Al Br_3$
8.4 5.5 3.8 2.6 1.68 0.90 0.24
AMPS PER SQ FT
$Zr(SO_4)_2 \cdot 4H_2O$
33.6 22.0 14.4 10.4 6.72 3.80 0.96
AMPS PER SQ FT
BRIGHT
SEMI-BRIGHT
DULL
ROUGH BURNT POWDERY
CRYSTALLITES
NO PLATE
TEMPERATURE – 0° C
CATHODE – COPPER

Fig. 2. Hull cell data for the cadmium-methanol bath with inorganic additives.

plating latitude. The conductivities of these solutions increased with increase in water content. The data in Fig. 5 indicate that the volume ratio of water to methanol must be less than 1.5 in order to obtain a satisfactory plate at 0°C. If the plating temperature is raised to 25C (Fig. 6) a satisfactory plate can still be obtained when the volume ratio of water to methanol is about 2.3. At this temperature, however, crystal growth areas appeared on the high current density ends of those specimens plated from cadmium-methanol solutions to which water had been added (Fig. 6).

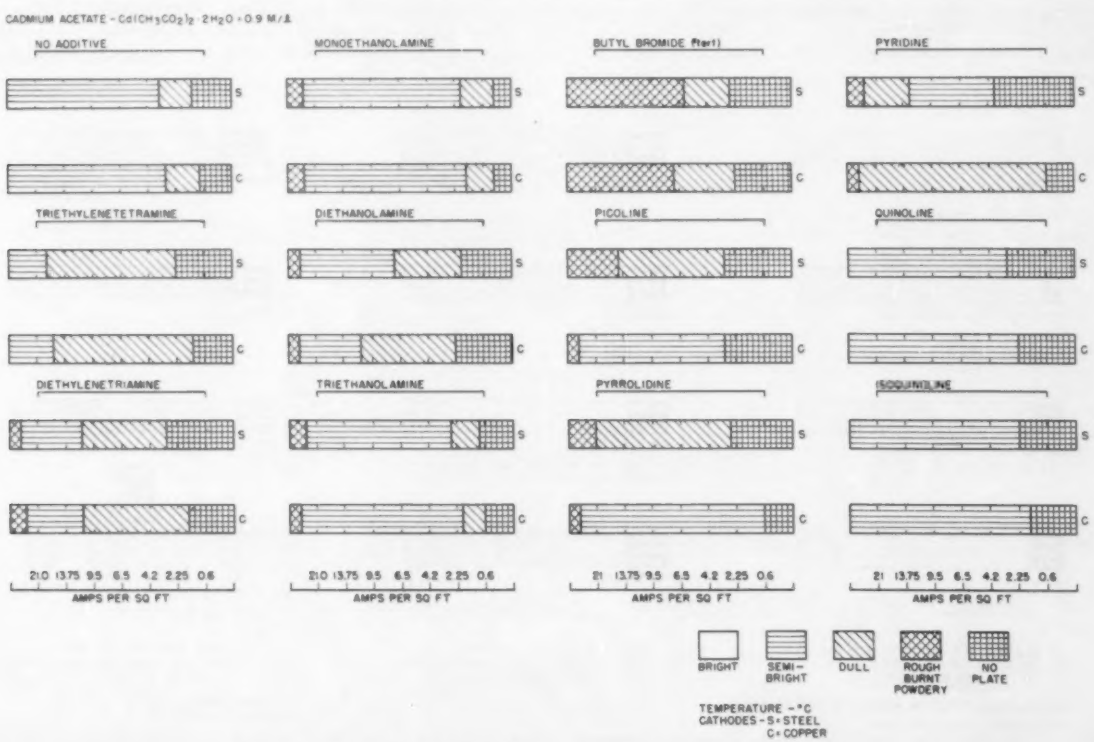

Fig. 3. Hull cell data for the cadmium-methanol bath with organic additives.

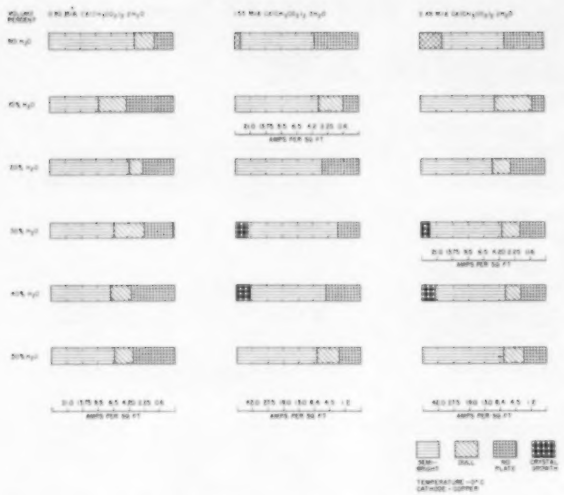

Fig. 4. Hull cell data for the cadmium-methanol solutions with increasing salt and water concentrations.

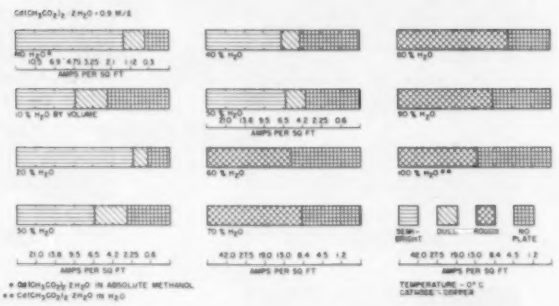

Fig. 5. Hull cell data for water tolerance in the cadmium-methanol bath.

Cadmium-Triethanolamine-Methanol Solutions (TEAM):

The Hull-cell data in Fig. 7 indicate that at constant volume of methanol (275 ml) and increasing concentrations of cadmium and TEA the best plates were obtained at (a) 0.69 mole TEA and 0.82–1.23 M/l cadmium, (b) 1.26 moles TEA and 0.76–1.14 M/l cadmium, (c) 1.74 moles TEA and 0.4–1.75 M/l cadmium, and (d) 2.16 moles TEA and 1.28–1.6 M/l cadmium. At constant volume of solution and increasing concentrations of cadmium and TEA (Fig. 8), the plating latitude generally decreased with increase in TEA concentration at cadmium concentrations of about 0.32–1.28 M/l. The effect upon plating characteristics produced by adding water to the bath is shown in Fig. 9. It can be seen that the TEAM bath, like the M bath, has a high water tolerance without a drastic reduction in plating latitude. The addition of small amounts of copper acetate to TEAM bath 224D (Table I) yielded reflective deposits over an appreciable current density range (Fig. 10). The addition of salts of cobalt, tin, and nickel also improved the appearance of the deposit.

CURRENT EFFICIENCY AND THROWING POWER

Plating baths 1000M and 224D (Table I) were used for these studies; the current density was 12.8 amp/sq ft. The procedure used to determine cathode and anode efficiencies was essentially that of Blum and Hogaboom.[4] A silver coulometer was connected in series with the bath under test, and a precision recording ammeter was used to monitor the current and the time. This provided a constant check on the performance of the coulometer. It turned out that the

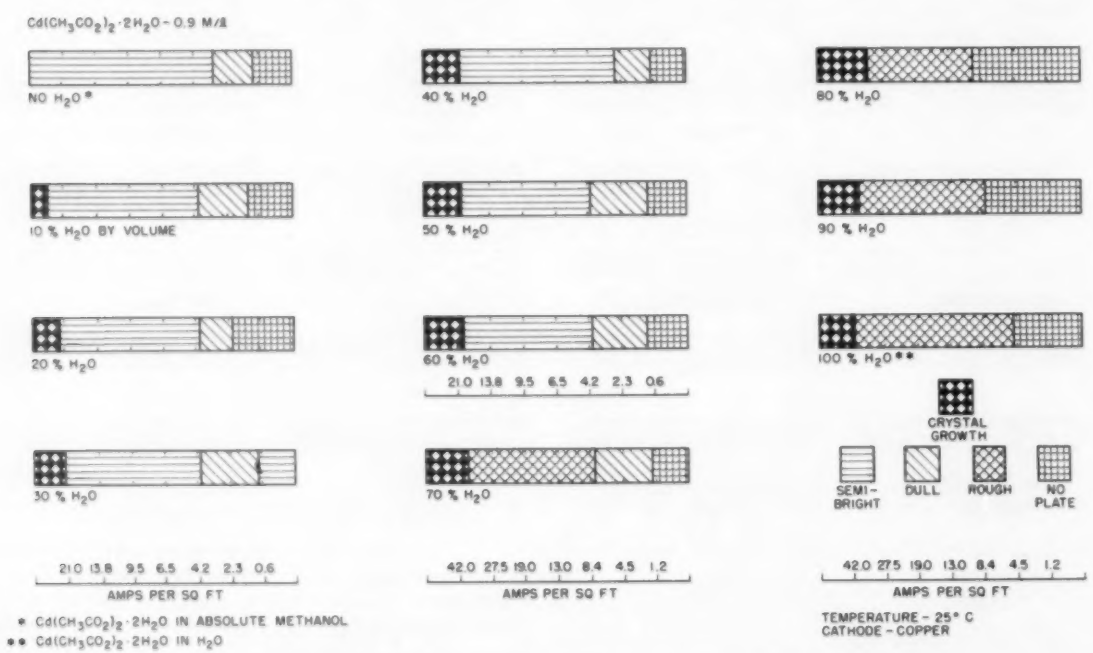

Fig. 6. Hull cell data for water tolerance in the cadmium-methanol bath.

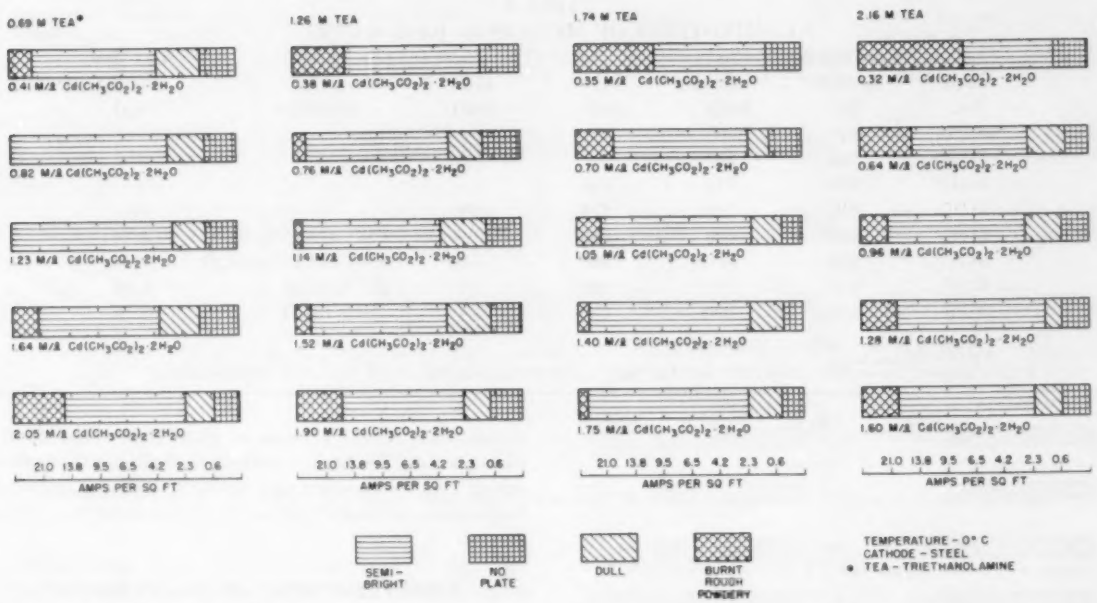

Fig. 7. Hull cell data for the cadmium-triethanolamine-methanol bath with increasing cadmium and triethanolamine concentrations at constant volume of methanol.

difference between the average recorded current and the current as calculated from the deposit of silver in the coulometer was about 0.04 per cent. The temperature of the coulometer was maintained at 25 ± 0.1C and that of the plating bath at 0° ± 0.5C. The average cathode efficiency of the methanol bath was about 94 per cent, and that of the TEAM bath approached 100 per cent. The average anode efficiency approached 100 per cent for each of the two baths.

Throwing power determinations were made using a modified Haring and Blum cell.[2,5] Deposits on the two cathodes were weighed and the throwing power was expressed as milligrams of deposit on the far cathode per 100 milligrams of deposit on the near cathode. Figure 11 shows the results for the methanol and TEAM baths, and the curve for the cyanide bath[2] was included for comparative purposes. The methanol and TEAM baths appear to have comparable throwing powers which tend to approach that of the cyanide bath at a far-to-near cathode distance ratio of about 1.5.

CONTINUOUS PLATING CHARACTERISTICS

TEAM bath 224D and methanol bath 1000M (Table I) were subjected to continuous tank plating at 0°C. The results

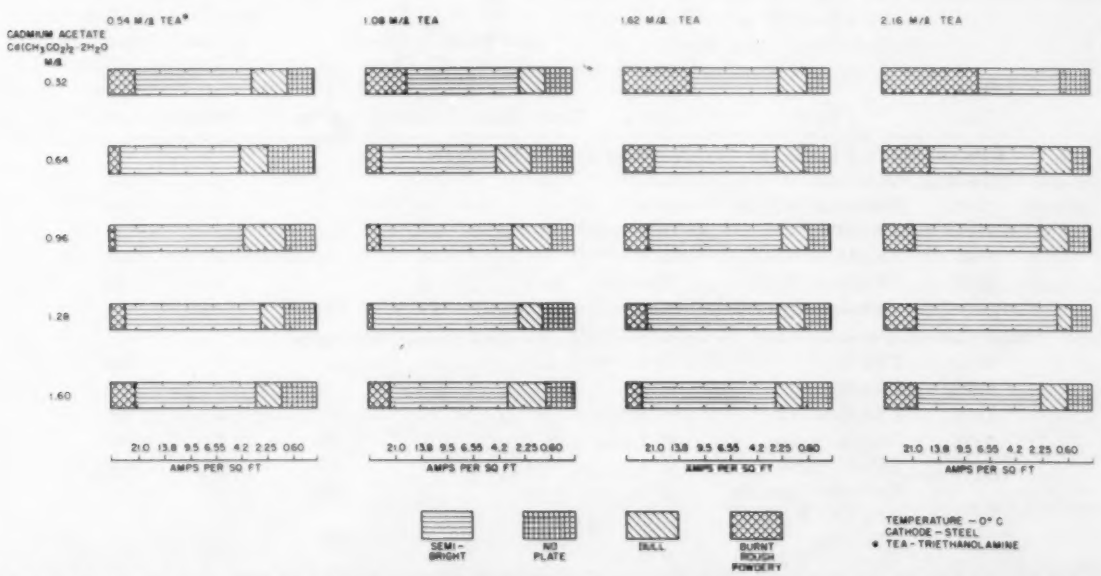

Fig. 8. Hull cell data for the cadmium-triethanolamine-methanol bath with increasing cadmium and triethanolamine concentrations at constant volume of solution.

TABLE I
COMPOSITION OF METHANOL BASE BATHS

Bath No.	Cadmium* Acetate (g)	Methanol (ml)	TEA† (ml)	H_2O (ml)	Additive	Additive Weight (g)
1000M	240	1000	—	—	—	—
175B	240	800	—	200	—	—
224D	240	715	285	—	—	—
314C	240	500	214	286	—	—
316B	240	800	200	—	$Cu(CH_3COO)_2 \cdot H_2O$	0.66
317C	240	800	200	—	$Co(CH_3COO)_2 \cdot 4H_2O$	0.99
318C	240	800	200	—	$SnCl_2 \cdot 2H_2O$	0.99
319B	240	800	200	—	$NiCl_2 \cdot 6H_2O$	0.66

*Cadmium Acetate—$Cd(CH_3COO)_2 \cdot 2H_2O$.
†TEA—Triethanolamine.
Cadmium Cyanide Bath—3.5 oz CdO and 17 oz NaCN per gal and 12 oz per 100 gal of R. O. Hull Co.—20 XL brightner.

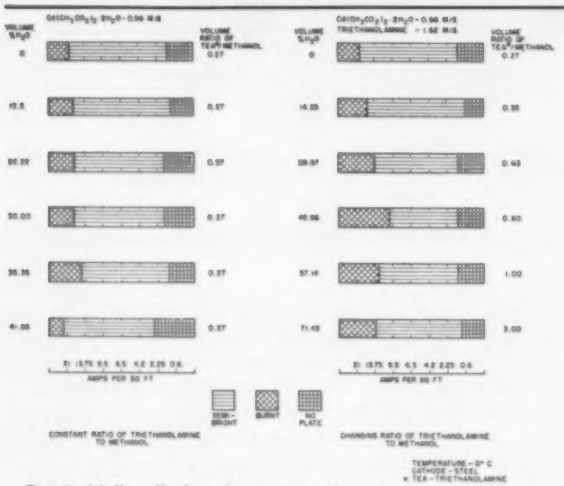

Fig. 9. Hull cell data for water tolerance in the cadmium-triethanolamine-methanol bath.

showed that it was possible to plate from these solutions 24 hours a day for 30 days without replenishing the cadmium salt or TEA by maintaining a constant volume of solution by the periodic addition of methanol and renewal of the cadmium anodes.

EMBRITTLEMENT CHARACTERISTICS

The delayed fracture test and the method of evaluating the results were described in previous papers.[3,6] Some specimens were tested under even more severe conditions. This involved placing the unplated specimen in tension at 75 per cent of the notched tensile strength of the unplated bar, plating under stress, and then keeping the plated specimen under stress for the 100-hour test peroid. The compositions of the baths used are given in Table I, and the delayed fracture data are given in Table II. The delayed fracture data show that (a) of the inorganic additives used, the nickel salt was the only one that did not affect the average holding time of

TABLE II
DELAYED FRACTURE DATA*

Bath No.	Bath	Current Density (asf)	Survival Time of Bars: Less Than 100 Hours — Average Survival Time (hrs)	Number of Bars	Per Cent	100 Hours or More (Unembrittled) — Number of Bars	Per Cent
Bars plated and loaded at 75% Notched Tensile Strength							
1000M	Methanol	15.0	—	—	—	15	100
175B	Methanol + H_2O	15.0	—	—	—	5	100
224D	TEAM**	19.2	—	—	—	17	100
314C	TEAM + H_2O	15.0	—	—	—	5	100
316B	TEAM + Cu	19.2	39.1	3	60	2	40
	Cadmium Cyanide	20.0	0.00	22	100	—	—
Bars plated or treated while in tension at 75% Notched Tensile Strength							
224D	TEAM	19.2	—	—	—	5	100
316B	TEAM + Cu	12.8	—	—	—	5	100
319B	TEAM + Ni	12.8	—	—	—	5	100
317C	TEAM + Co	12.8	52.3	1	20	4	80
318C	TEAM + Sn	12.8	29.8	4	57	3	43
	Cadmium Cyanide	20.0	0.01	1	100	—	—
	50% HCl Pickling Solution	—	0.01	1	100	—	—

*Specimens were AISI 4340 Steel, heat treated to 285,000 psi ultimate (smooth) tensile strength. Root radius of notch: 0.001 inch.
**TEAM—Triethanolamine—Methanol.
NOTE—Baking was not employed after this bath.

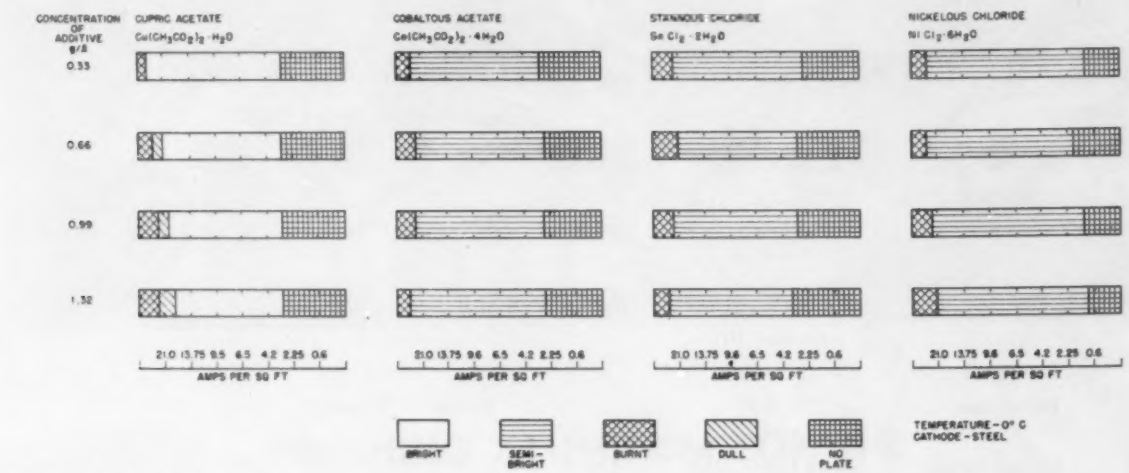

Fig. 10. Hull cell data for the cadmium-triethanolamine-methanol bath with increasing concentration of some inorganic additives.

the plated tensile bars, (b) addition of water to the M or TEAM bath did not affect the holding time, (c) 20 out of 20 bars that were plated from the methanol solutions, free of inorganic additives, survived the 100-hour test, and (d) 27 out of 27 bars that were plated from the TEAM solutions, free of inorganic additives, survived the 100-hour test. These results show that both the methanol and TEAM baths fulfill the criteria for nonembrittlement as set forth in this series of papers.

SUMMARY

1. The plating characteristics of cadmium-methanol (M) and cadmium-triethanolamine-methanol (TEAM) baths with and without additives, have been investigated. For the M bath satisfactory plates were obtained at cadmium concentrations of about 0.9–1.35 M/l. The TEAM bath at constant volume of methanol (275 ml) yielded the best plates at (a) 0.69 mole TEA and 0.82–1.23 M/l cadmium, (b) 1.26 moles TEA and 0.76–1.14 M/l cadmium, (c) 1.74 moles TEA and 0.4–1.75 M/l cadmium, and (d) 2.16 moles TEA and 1.28–1.6 M/l cadmium. At constant volume of solution and increasing concentrations of cadmium and TEA the plating latitude generally decreased with increase in TEA concentration.

2. Both the M and TEAM baths showed a high water tolerance without affecting the plating latitude to any appreciable extent.

3. The cathode efficiency for the M bath was about 94 per cent and that for the TEAM bath approached 100 per cent. Anode efficiencies for both baths approached 100 per cent.

4. The M and TEAM baths have comparable throwing powers which tend to approach that of the cyanide bath at small distance ratios of far-to-near cathode.

5. Continuous tank plating at 0°C showed that it was possible to plate from the M and TEAM baths 24 hours a day for 30 days without attention, except for maintaining a constant volume of liquid by periodic additions of methanol and renewal of the cadmium anodes.

6. Results of delayed fracture tests, using plated cylindrical notched specimens of AISI 4340 steel heat treated to approximately 285,000 psi ultimate tensile strength, and subjected to an applied load of 75 per cent of the notched tensile strength of the unplated specimen, indicate that the M and TEAM baths are nonembrittling.

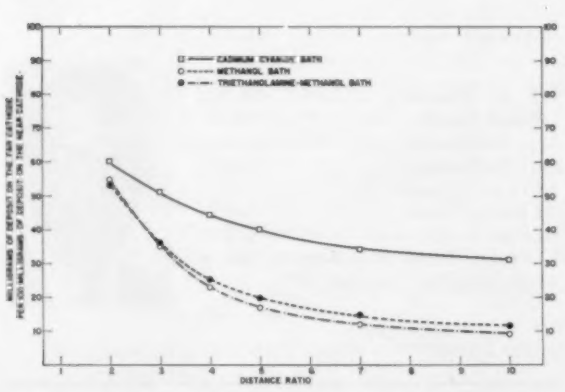

Fig. 11. Throwing power evaluation of the methanol and triethanolamine-methanol baths.

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[2]Vlannes, P. N., and S. W. Strauss, "Progress Toward the Development of a Nonembrittling Cadmium Electroplating Process. II. Use of Aliphatic Amino Acids as Complexing Agents in Aqueous Baths", Plating **46**: 1046–1051, 1959.

[3]Hull, R. O., Proc. Am. Electroplaters' Soc. **27**:52, 1939; Monthly Rev. Am. Electroplaters' Soc. **26**:753, 1938.

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TABLE III

TESTS FOR NOTCH COVERAGE OF PLATED NOTCHED TENSILE BARS

Test Solution*	Typical Compositions	Color Effects on Plated 4330 SS				
		Basis Metal	Cd	Zn	Cr	Ni
Chromic Acid—A	1–3g CrO_3 100 ml water 1 ml conc. HCl	—	Bronze	Bronze	—	—
Chromic Acid—B	10g CrO_3 100 ml H_2O 5 ml conc. HCl	Rust	Bronze	Bronze	—	—
Potassium Dichromate	4–10g $K_2Cr_2O_7$ 100 ml H_2O 1 ml conc. HCl	—	Bronze	Bronze	—	—
Copper Sulfate	5–7g $CuSO_4.5H_2O$ 100 ml H_2O 1 ml conc. H_2SO_4	Copper	Grey-Brown	Brown-Olive	—	—
Potassium Permanganate	0.3-0.5g $KMnO_4$ 100 ml H_2O 1 ml conc. H_2SO_4	Rust	Rust	Rust	—	—
		—	—	—	—	—

*Dipping Time—5 to 15 seconds with agitation of solution.

APPENDIX

SIMPLE CHEMICAL TESTS FOR NOTCH COVERAGE OF PLATED TENSILE BARS

In the evaluation of the delayed fracture test, criteria for acceptable plating of the tensile bar include complete coverage by cadmium of the root of the notch as judged by microscopic examination before testing, and as confirmed by microscopic examination of a metallographic section after completion of the 100-hour test. Since this investigation involved the testing of a large number of plated tensile bars it was desirable to develop a simpler, cheaper, and less time consuming test for coverage of the root of the notch. A quick and simple chemical test for this purpose should involve reactions in which (a) a color is produced on the plate of the metal without affecting the basis metal, (b) a color is produced on the basis metal without affecting the plate, or (c) easily distinguishable contrasting colors are produced on the plate and on the basis metal. Results of such tests would lend themselves readily to visual or simple microscopic examination without the necessity of preparing a metallographic section. Experiments along these lines were performed on specimens that had been plated with cadmium, zinc, chromium, and nickel.

Table III outlines several quick and simple chemical tests that were found to be effective in determining whether or not the notch, including the root, was covered. The results show that the test for cadmium or zinc can be made by producing a color on the plate without affecting the basis metal (the dichromate test or the chromic acid test-A), or by producing contrasting colors on the basis metal and on the plate (the copper sulfate test or the chromic acid test-B). The test for chromium or nickel involves the production of a color on the basis metal without affecting the plate (the permanganate test, copper sulfate test, or chromic acid test-B).

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P. N. Vlannes is a chemist with the Chemical Metallurgy Section, Physical Metallurgy Branch, U. S. Naval Research Laboratory, Washington 25, D. C. He formerly held a research position with Department of the Interior, Bureau of Mines. Mr. Vlannes received his BS degree in chemistry from Centenary College of Louisiana and MS at Xavier University, Cincinnati, Ohio.

Fig. 1

Fig. 2

FINISHING ALUMINUM FOR THE PRODUCTION OF AN OSCILLOSCOPE

by A. EVERETT COOK*

ALUMINUM is received at the plant on pallets which hold the 4- by 8-foot sheets of aluminum purchased from the three leading manufacturers. The first step in processing is the shearing of each sheet to the required size (see Figs. 1 and 2). It is then moved along to the Rotex area for punching and drilling the necessary holes. (Fig. 3)

After being punched, the panels are bent to conform to specifications (Fig. 4), and sent into the finishing department. Other panels go directly from the shearing room to the press room and are stamped out in specific shapes or are deep-drawn with a 25-ton press (Fig. 5). These panels are covered with a forming oil to facilitate the drawing or forming of the panels without fracturing them.

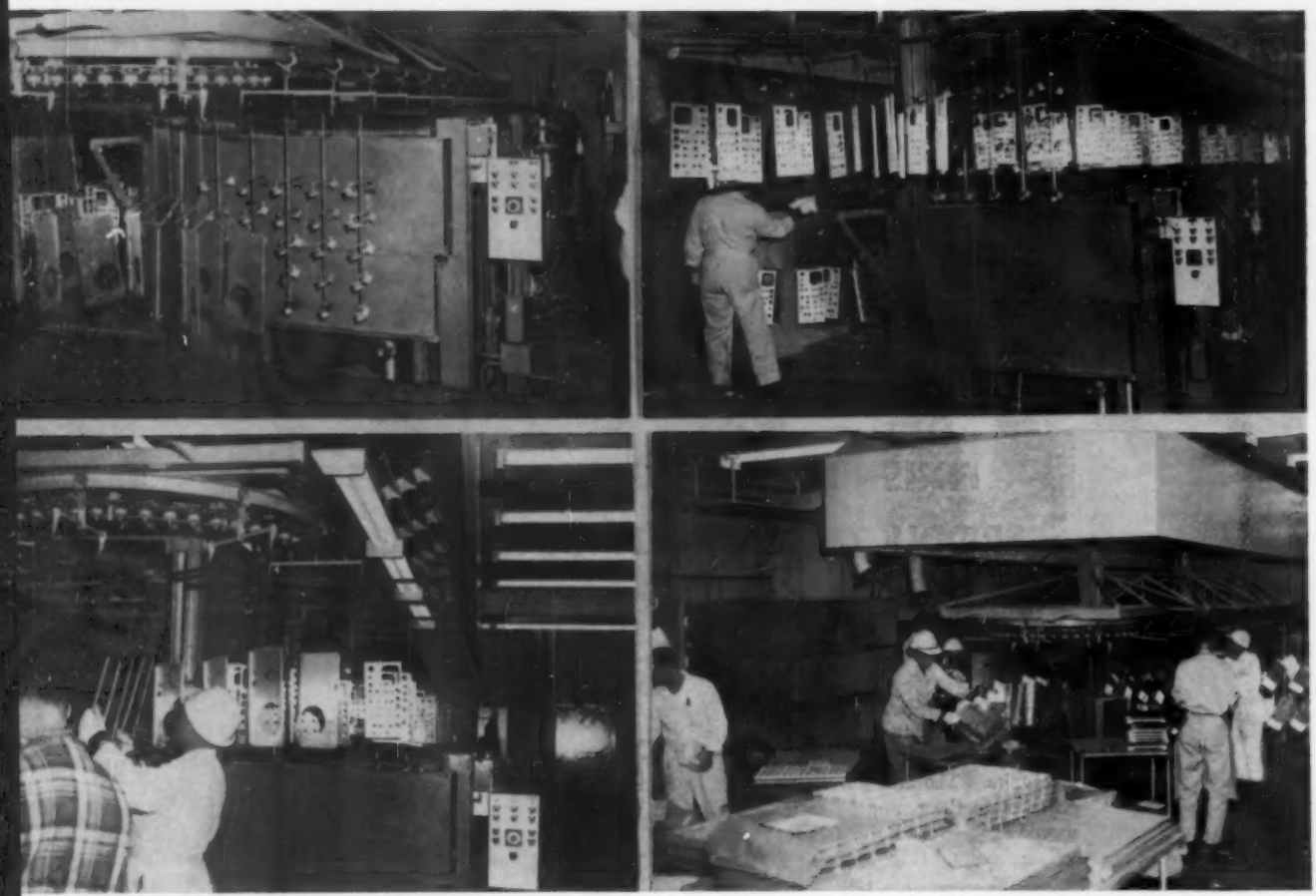
All of the panels to be used as component material inside the oscilloscope are now sent to the etch department. The automatic etch machine (Figs. 6, 7, and 8) was designed by Frank Maniatis, design engineer, and built by Tektronix. The racks are loaded manually and placed on the overhead conveyor. The machine puts the parts through the following process:

1. Non-silicated alkaline cleaning to remove the dirt and forming oils. This is a combination spray and soak tank, using 4 oz/gal of an inhibited non-silicated, alkaline cleaner.**
2. A water spray rinse to remove the cleaner.
3. Four stops in the cycle in a sodium hydroxide bath, 16 per cent concentration at 160F, to remove an average of 1.5 mils of surface per side.
4. A water spray rinse to remove the caustic.
5. A dip in 25 per cent nitric acid to neutralize the caustic and remove the formed smut.
6. A long series of water rinses in a 5000-gallon constant overflow tank.

(Top) Fig. 3. (Center) Fig. 4. (Bottom) Fig. 5.

*Chief Production Chemist, Tektronix, Inc., Beaverton, Oregon.

**Expray-AP, product of Wyandotte Chemicals Corporation.



(Top, left) **Fig. 6.** (Top, right) **Fig. 7.** (Bottom, left) **Fig. 8.** (Bottom, right) **Fig. 9.**

7. A 30-second dip in a water-soluble lacquer,* two and one-half per cent solids, resin concentration.
8. A short stand-off period to drain.
9. Baking for three to four minutes at approximately 400F, in an infrared oven.
10. Cooling, unloading and packing for storage.

The author evaluated the program to reduce the etching time from a four-minute cycle to a two-minute cycle in order to increase productivity. The concentration of NaOH was increased from 7 to 16 per cent in the 1200-gallon tank. The solution is used for approximately three weeks before dumping and no difficulty is experienced with the aluminum build-up —it remains below a 3 per cent level.

The dip lacquer is now being used as an aid in increasing the production, having converted from a solvent-based lacquer. Much time was spent to obtain a water-based lacquer that could be used as a substitute. The final product will have the following properties: Soluble in water, no separation, ease of mixing, no build-up of lacquer around the holes or on the edges, free flowing, easy maintenance and control, complete drying at the prescribed time and temperatures, and a resistance to solvents, thinners, detergents, and handling dirt. The aluminum alloys etched are either 6061, 5052 or 4043, and range in thickness from 0.020 to 0.080 inches.

Panels to be welded are given a 20-second etch, without lacquering (Fig. 9) and sent into the welding area for the welding assembly (Fig. 10). The panels then go to the painting department for their final finish.

Some of the panels need identifying markings on them in order to simplify the later adding of components. These panels, after etching and lacquering, are sent to the silk screen department, where the necessary marks, trademarks, code numbers and component identification information are either printed or silk-screened onto them (Fig. 11).

OUTSIDE PANELS

The outside panels, fans, housing parts and railings are sent directly from the Rotex area to the paint department. The parts are hung on an overhead conveyor chain (Fig. 12) and sent through a phosphatizing bath (Fig. 13). This pretreatment system has two stages—a combination cleaning and phosphating bath, and a rinsing bath. This system was also designed and built at the plant and operates very efficiently. The 1400-gallon tank (Fig. 14) has a concentration of 2.5 oz/gal of an iron phosphate-inhibited phosphoric acid cleaning

* LV-10, manufactured by Norris Paint Company, Salem, Oregon.

and phosphatizing compound,* and coats a test sample of steel with 50–60 milligrams of phosphate per square foot. The conveyor moves at a speed of 12 feet per minute, and enters next into the rinse area. The parts are sprayed with warm, fresh water and carried into the drying oven. After leaving the drying oven (Fig. 15), they travel to the spray paint booth. Here the parts are sprayed with phenolic resin paint,** which gives them the custom finish known to the Tektronix customers. The water-curtain booth contains 350 gallons of water, with ½ oz/gal of a non-silicated, low-foaming paint deflocculant† added to destroy the paint and float the resin, where it is then skimmed off and removed (Fig. 16). The parts then travel back to the oven (Fig. 17) and are baked at 375F for a period of 22 minutes, and returned to the loading area where they are unloaded and sent to the warehouse for storage until needed.

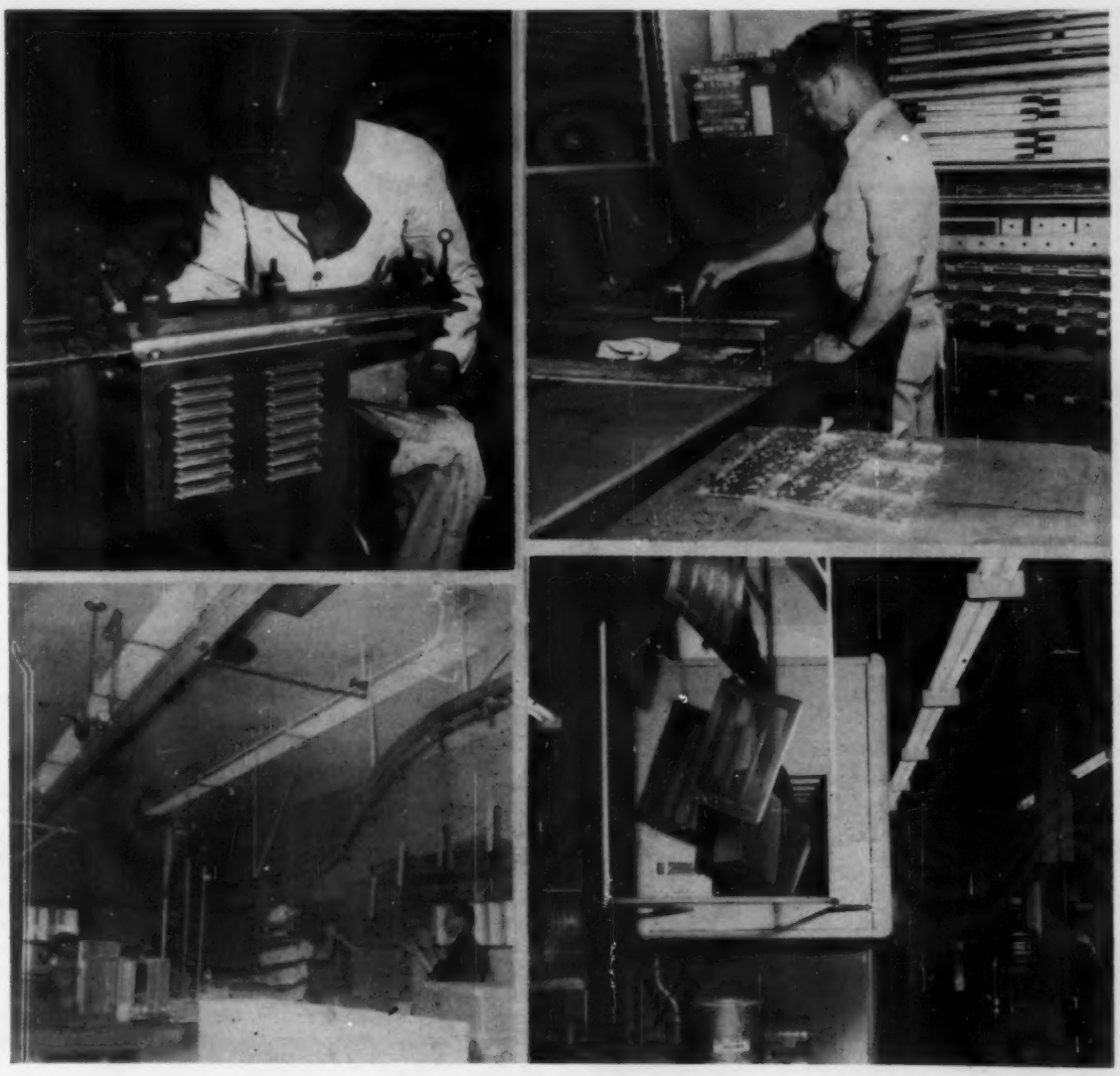
*Wyandotte's Pre-Fos.
**Fuller's Symel Blue Wrinkle Phenolic Resin Paint.
†DuBois Differentiated Klarafant.
††LePage's No. 1042 Photo Engraving Glue.

FRONT PANEL

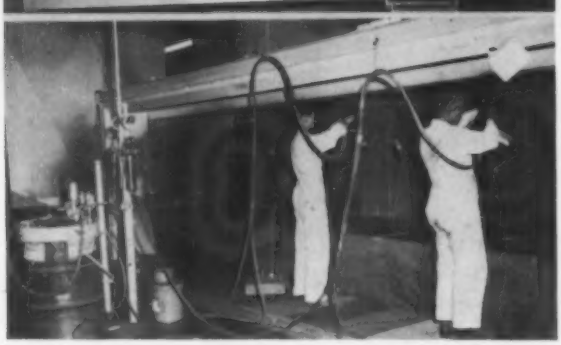
The front panel on the "scope" is anodized in the panel-craft department. Here, the 24S (mirror-bright) aluminum alloy is sheared to size, etched in a sulfuric acid-chromic acid bath, and covered with a resist.†† The panel is exposed to an arc light through a negative and then is etched in a 32° Baumé solution of ferric chloride, followed by rinsing and formation to the desired shape. The resist is removed in TSP, dipped in the sulfuric-chromic bath and anodized in a 15 per cent sulfuric acid bath at 12 am/sq ft for 35 minutes.

After rinsing, the panels are sealed in boiling water for one-half hour and dried. The etched areas are painted with the various colors required. The panels after leaving the panel-craft area go to the touch-up area (Fig. 18) for finishes requested other than the standard finish.

Much effort is made to produce the finest possible finish. At present, the desirability of changing the finish from a phenolic resin, wrinkle finish, to a harder finish of a vinyl resin



(Top, left) Fig. 10. (Top, right) Fig. 11. (Bottom, left) Fig. 12. (Bottom, right) Fig. 13.



(Top) **Fig. 14.** (Center) **Fig. 15.** (Bottom) **Fig. 16.**

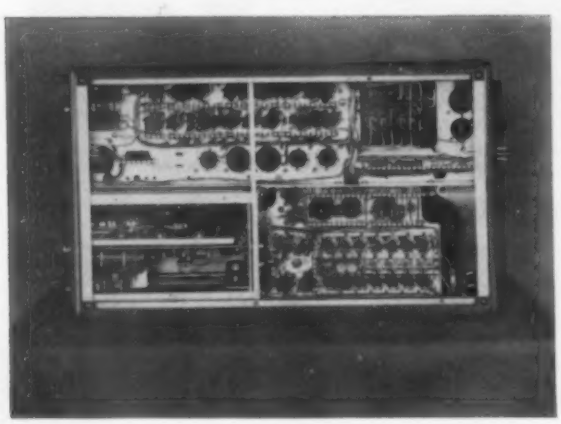
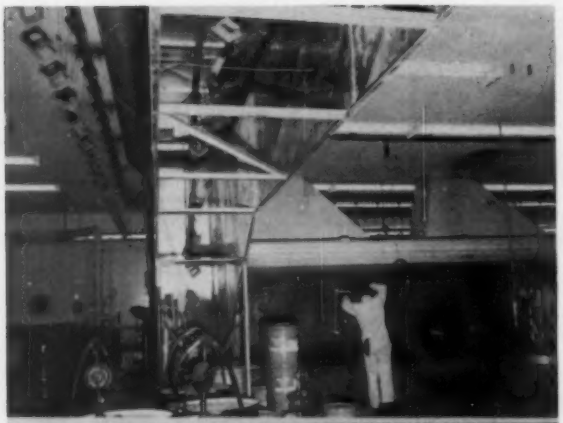


Fig. 19



(Top) **Fig. 17.** (Bottom) **Fig. 18.**

nature, using an embossed aluminum panel, is being investigated. Figure 19 shows the inside of a completed oscilloscope with the side panel off.

A. Everett Cook, was born in Laramie, Wyoming, in 1929, and attended schools in Beaverton, Oregon. Secondary education began at Pacific University in Forest Grove, Oregon, and continued until he entered the U. S. Navy at the time of the Korean Conflict. During his service, he was selected for the Radar Specialist program, and remained active in this category until shortly before discharge, when placed in charge of a personnel group in Seattle, Washington. After his Naval service, he was employed by the Portland Gas and Coke Co. as an industrial chemical analyst for five years. He entered the University of Portland, Portland, Oregon, where he majored in chemistry and minored in physics and mathematics. He was employed at Reynolds Metals Co., Troutdale, Oregon, as a senior analyst, specializing in petroleum product analysis. In June 1958, he joined Tektronix, Inc., Portland, Oregon, as a research chemical engineer. In March 1959, he transferred to the production area as chief production chemist, handling the problems of metal finishing and preparation, oils and plastics, inks and dyes, paints, and electrochemical problems in electronics and toxicology. He is affiliated with the Portland Industrial Chemists Association, American Electroplaters' Society, First Vice President of Portland Branch, Applied Spectroscopy Society, International Crystallographers Association and American Society for Metals.

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"ZIN-O-LYTE" BRIGHTENER—Widely used powder form... gives brilliant blue-white zinc plating without bright dipping.

"ZIN-O-LYTE" SPECIAL—An economical brightener (powder form) for barrel plating that gives bright deposits without bright dipping.

Whatever your requirement may be, Du Pont zinc-plating brighteners will give you bright, uniform deposits of the finest quality. For more information on new "Durobrite" Addition Agent 26 or other Du Pont brighteners, call your nearest Du Pont distributor or district office, or write: Du Pont, Electrochemicals Department, Sodium Products Division, Wilmington 98, Delaware.

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BETTER THINGS FOR BETTER LIVING ... *THROUGH CHEMISTRY*

Frederick Fulforth

FULFORTH, PINNER UPGRADED TO AES HONORARY MEMBERSHIP

To the select circle of AES Honorary Members now reduced by death to a choice twelve, the Supreme Society, at its Annual Meeting held during the 47th Annual Convention, elected two bright additions to that galaxy, namely Past President Frederick Fulforth and Past President Walter L. Pinner.

Championed for consideration by the AES's Southeastern and Detroit Branches respectively, and selected by the Society's Honorary Membership Awards Committee, Past Presidents Fulforth and Pinner were ratified by the Executive Board. They were then nominated at the Supreme Society meeting and both were elected.

Each was supported in his nomination by a distinguished record of AES service. Associated with the Metal and Thermit Corporation, Mr. Fulforth was National President in 1940–1941. An executive of the McGean Chemical Corporation, Mr. Pinner headed the Society in 1945–1946.

Walter L. Pinner

DR. CHARLES L. FAUST

CHARLES L. FAUST is a Missourian by birth. He attended the Richmond Heights elementary and Maplewood high schools in these St. Louis suburban communities. When he entered St. Louis University in 1925, art and mathematics were his major interests, and he intended to become a commercial artist and illustrator. His first science course changed that. Dr. Wood and chemistry and its applications so intrigued him that after his first college year he changed to chemical engineering at Washington University in St. Louis.

His introduction to electroplating took place under the auspices of his good friend, Professor Lawrence E. Stout, through research and a short thesis on zinc-cadmium alloy plating which fulfilled one of the requirements for his BS in chemical engineering. The results of the study were published in the *Trans. Electrochem. Soc.*, and Dr. Faust was on his way in electrochemistry and metal finishing. An industrial fellowship at Washington University followed and led to a second thesis on electrodeposition of alloys and an MS in chemistry, again under the guidance of Dr. Stout.

Electrochemistry in general and electrodeposition in particular were entering an era of great progress, and Dr. Faust continued his preparation by entering the University of Minnesota graduate school as a graduate assistant in chemistry (and as a student). Here, Professor Charles A. Mann, long-time friend and associate of Oliver P. Watts and Charles W. Burgess, taught industrial organic and industrial inorganic electrochemistry. Dr. Faust received his PhD degree in chemical engineering. His thesis on electrodeposition of alloys as well as much of his practical engineering study was under the able teaching of Professor George A. Moutillon.

"Have Job—Will You Travel?"

In 1934 the opportunity to join the staff of Battelle Memorial Institute came to Dr. Faust in the form of a telegram which read: "Have 3-month job, do you want it?" He accepted the invitation. Battelle's total staff numbered 65 persons then. It numbered over 2300 in Columbus in Dr. Faust's 25th year.

At Battelle, his interest continued in alloy plating and metal finishing. He pioneered practical electropolishing methods and is also internationally known for his discoveries in electroplating. During the past 15 years, he has been Chief of Battelle's Electrochemical Engineering Division which, under his guidance, has forwarded research on extractive electrometallurgy, batteries, electrorefining, electrowinning, and other related areas. Dr. Faust has authored or coauthored over 80 papers, and his name is on over 100 U.S. and foreign patents.

The Full, Rich Scientific Life

In addition to his productive research activities, Dr. Faust has also contributed generously to the advancement of his profession. During World War II, he served on subcommittees of the War Metallurgy Committee and was active on the Manhattan Engineer Project.

Dr. Faust has given freely of his time by speaking frequently before branches and educational sessions of AES; chapters of ASM; American Society of Tool Engineers; Society of Aircraft Materials and Process Engineers; The Electrochemical Society; and the American Chemical Society. He is a charter member of the Columbus Branch of AES for which he served several terms on the Board of Managers and as a Delegate. He was an associate editor of THE MONTHLY REVIEW and PLATING MAGAZINE from 1944 to 1949. He was corecipient of the AES Proctor Award in 1940, of gold medals in 1951 and 1955, and of the Carl E. Heussner Memorial Award in 1955.

Dr. Faust has had a long interest in The Electrochemical Society. He was a member of the Board of Directors from 1942 to 1944 and from 1947 to 1951; national vice president 1947–1949; and national president in 1950. He has served on a number of AES and Electrochemical Society committees. At the present time he is Editor of Section 4, on Electrochemistry, of *Chemical Abstracts*. By word and action, Dr. Faust has demonstrated his strong faith in the future of electroplating and metal finishing. In his recent writings he has presented a strong case for combining electroplating with other aspects of metal finishing to achieve a more advanced approach to the technology which he would call "surface metallurgy." Workers in the field will undoubtedly hear more from him on this subject.

AES NEWS

Dr. William Blum

Dr. A. Kenneth Graham

Dr. Charles L. Faust

DR. CHARLES L. FAUST AWARDED AES's HIGHEST SCIENTIFIC HONOR

American Electroplaters' Society, Inc. (AES), climaxing its fifty-first year with a memorable 47th Annual Convention held at the Statler Hotel, Los Angeles, California, July 24–28, 1960, first such AES Convention west of St. Louis in the AES's long history, named the third winner of its AES Scientific Achievement Award, the Society's highest scientific honor. It selected for that coveted award, the distinguished scientist, Dr. Charles L. Faust, Chief, Electrochemical Division, Battelle Memorial Institute, Columbus, Ohio.

The selection of Dr. Faust as the third winner of that AES honor was announced to the large audience attending the Grand Opening Session of the 47th Annual Convention held in the Golden State Room of Los Angeles' Statler-Hilton Hotel, Monday morning, July 25. The report was made by Dr. Henry B. Linford of Columbia University, chairman of the Selection Committee, itself composed of well-known scientists, namely Dr. Abner Brenner, Myron B. Diggin, Dr. Russel E. Harr, Dr. Louis Weisberg and Dr. Harold J. Wiesner.

Among those present at that meeting was Dr. William Blum who, as the first winner of the same annual Award, delivered the first "William Blum Lecture" before an overflow audience at the Opening Session of the Fifth International Conference on Electrodeposition and Metal Finishing in the Statler-Hilton Ballroom at the Society's GOLDEN JUBILEE CONVENTION in Detroit, June 15, 1959.

Dr. Faust, like Dr. Blum and Dr. A. Kenneth Graham, second winner, earned selection by his "decade-plus" accomplishments in advancing the theory and practice of electroplating, metal finishing and allied arts; in raising the quality of its processes and products, and in enhancing the dignity and status of the profession.

Dr. Faust will deliver the third "William Blum Lecture" at the AES's Annual Convention to be held in Boston in 1961. He will receive a scroll, a $500 honorarium and other attendant honors.

WINNERS OF AES'S HIGHEST SCIENTIFIC HONOR

The AES Scientific Achievement Award is the Society's highest scientific honor and is awarded annually. Created in 1957, the first selection was made in 1958, and that first winner, Dr. William Blum, delivered the first "William Blum Lecture" at the AES's GOLDEN JUBILEE CONVENTION in Detroit in June 1959.

Above the three winners to date, namely Dr. Blum (1958); Dr. A. Kenneth Graham (1959) and Dr. Charles L. Faust (1960).

EXECUTIVE BOARD APPOINTMENTS TO AES's BUSY BOARDS AND COMMITTEES

To AES standing Boards and Committees for three-year terms effective with the First Business Session of the Supreme Society held during the recent 47th Annual Convention, the Executive Board appointed these AES stalwarts:

EDITORIAL BOARD:
Dr. Henry Brown, Edward E. Oberland, Gerald H. Lux. Also George J. Marotta (1 year)

EDUCATIONAL COMMITTEE:
Ezra A. Blount, Edward C. Bertucio, Dr. Nelson F. Murphy

HONORARY MEMBERSHIP AWARD COMMITTEE:
Herberth E. Head, Arthur G. Pierdon. (2-year term)

MEMBERSHIP COMMITTEE:
James E. Cogan, L. Truman Stoner, Robert D. Martin. Also Bruce Leslie (Consultant for Australia) and S. A. Frost (Consultant for Canada)

PUBLICATIONS COMMITTEE:
Dr. Abraham M. Max, Dr. Roy C. Spooner. (One more to be appointed)

PUBLIC RELATIONS COMMITTEE:
Harold J. McCracken, G. Ross Davidson, Allen Ferguson

RESEARCH COMMITTEE:
Dr. B. B. Knapp, Irvin M. Weiss, Whitney Snyder

SCIENTIFIC ACHIEVEMENT AWARD COMMITTEE:
Dr. William Blum, William M. Tucker

To each, AES extends congratulations and the hearty wish that his tenure will be bright. PLATING MAGAZINE joins in these good wishes.

SEVEN AES AUTHORS HONORED AT SOCIETY'S 47th ANNUAL CONVENTION

A. W. Wallbank

"The fiscal year of 1959–60," reported the 1959–1960 Paper Awards Committee, "represented a high tide in the publishing efforts of the American Electroplaters' Society (AES). The Committee on Paper Awards considered 49 papers published in PLATING MAGAZINE and 39 published in TECHNICAL PROCEEDINGS, a total publishing effort of 88 papers for the past fiscal year. Over half of these papers were outstanding in quality.

"In accordance with recorded AES policy, the Committee on Paper Awards has duly considered and rated all eligible papers for the three major awards and the five special awards. The following were judged the winners:

The Carl E. Heussner AES Gold Medal Award

Co-Sponsored by AES and the United Platers' Foundation (Glenn H. Friedt, Trustee) for the best paper published in AES publications during the fiscal year. Awarded to "Barrel Plating with Special Consideration to Protection of Thread Diameters" by A. W. Wallbank, Ionic Plating Company, Ltd., Birmingham, England. (TECHNICAL PROCEEDINGS, 1959 Edition)

The AES Silver Medal Award

Sponsored by AES for the second best paper. Awarded to "Chemical Polishing of Copper and Its Alloys" by Dr. Heinz Spähn, Laboratorium fuer Physikalische Chemie und Elektrochemie, Technische Hochschule, Stuttgart. (TECHNICAL PROCEEDINGS, 1959 Edition)

The AES Bronze Medal Award

Sponsored by AES for the third best paper published during the fiscal year. Awarded to "Hydrogen Embrittlement of High-Strength Steels During Cadmium, Chromium and Electroless Nickel Plating" by William L. Cotton, Boeing Airplane Company. (PLATING MAGAZINE, February 1960)

The George B. Hogaboom Memorial Nickel Plating Award

Co-Sponsored by AES and its Hartford Branch. Awarded to "The Automatic Additions of All Chemicals to the Nickel Plating Bath" by Mitchell G. Osman, Radio Corporation of America. (PLATING MAGAZINE, July 1959)

The Chromium Plating Award

Co-Sponsored by AES and the Nutmeg Chrome Corporation. Awarded to "The Development of Chromium Plating" by George B. Dubpernell, Metal & Thermit Corporation. (PLATING MAGAZINE, June 1959)

The Robert S. Leather Mechanical Finishing Award

Co-Sponsored by the AES and the Lea Manufacturing Company. Awarded to "The Nature of Mechanically Polished Surfaces" by L. E. Samuels, Department of Supply, Defence Standards Laboratories, Australia. (TECHNICAL PROCEEDINGS, 1959 Edition)

The John J. Hanney Memorial Copper Plating Award

Co-Sponsored by AES, its Grand Rapids Branch and the Metal & Thermit Corporation. Awarded to "Copper Electroforming of Heat Sinks for Missile Nose Cones" by Frank D. Foley, Avco Corporation. (PLATING MAGAZINE, November 1959)

"No Precious Metal Plating Award can be made," the Committee reported, "because there were only two papers published" (A minimum of three are required for judging).

To its successor (1960–1961 Paper Awards Committee), the 1959–1960 Committee headed by William M. Tucker, Eastman Kodak Company and composed of Dr. Henry Brown, The Udylite Corporation and Clarence H. Sample, International Nickel Company, consequently referred the two such 1959–1960 papers for 1960–1961 consideration for special award. These are "Precious Metals" by Dr. Edward A. Parker, Technic, Inc. (PLATING MAGAZINE, June 1959), and "How Versatile Application Techniques for Gold Solve Aircraft and Missile Problems" by William L. Aves, Jr., Chance Vought Aircraft, Inc. (PLATING MAGAZINE, November 1959).

Dr. H. Spahn

William L. Cotton

Mitchell G. Osman

Dr. G. Dubpernell

Dr. L. E. Samuels

Frank D. Foley

Herberth E. Head

TWO AES MEMBERS RECEIVE EXECUTIVE BOARD AWARDS OF MERIT

Awarded by the Executive Board for meritorious service to the American Electroplaters' Society, the Board voted its Award of Merit to two AES valiants, namely Howard J. McAleer and Past President Herberth E. Head. The presentation was made by National President Ralph D. Wysong at the Second Business Session of the Supreme Society held at the 47th Annual Convention, Thursday, July 28, 1960.

Mr. McAleer was thus honored for distinguished AES service as General Chairman of the Society's Fifth Industrial Finishing Exposition. Mr. Head was recognized not only for his Co-Chairmanship of AES's First Industrial Finishing Exposition but also for service on every AES Exposition Committee since then.

Howard J. McAleer

PAST PRESIDENT PINNER AWARDED FIRST PROCTOR MEMORIAL LEADERSHIP AWARD

Presented for the first time in the history of American Electroplaters' Society, Inc. (AES), the Charles Henry Proctor Memorial Leadership Award, inaugurated in 1959 during the AES's GOLDEN ANNIVERSARY, was won and received by Past President Walter L. Pinner at the AES's 47th Annual Convention, Los Angeles, California, July 24–28, 1960. He earned that honor for outstanding leadership and AES service performed as Chairman of the acclaimed Fifth International Conference on Electrodeposition and Metal Finishing concurrently held by the Society with its GOLDEN JUBILEE CONVENTION and Industrial Finishing Exposition in Detroit, June 15–19, 1959.

Highest non-scientific non-technical, Award of the Society, the Proctor Award is sponsored for the AES by Mr. and Mrs. William Osborne Preston, son-in-law and daughter respectively of the late Charles Henry Proctor, founder of the Society. Winner is annually selected from among nominees by respective Branches and Committees of the Society. The 1959–1960 Selection Committee, the Award's first, was composed of the donors plus National President Ralph D. Wysong; National Executive Secretary John P. Nichols; Research Committee Chairman James D. Thomas; Order of Past Presidents Chairman Samuel Heiman; Branch President Rolland E. Campbell (Buffalo Branch) and Past Branch President James H. Lee (British Columbia Branch).

Mr. Pinner was announced as 1959–1960 winner at the Farewell Banquet of the AES's Los Angeles Convention, Thursday evening, July 28 by Selection Committee Chairman Wysong, and was there presented, midst thunderous applause, with

Walter L. Pinner

a $150 cash award plus a handsome laminated scroll. From among a number of contenders nominated by AES Branches and Committees, he was the overwhelming choice of the Selection Committee on the strength and significance of his leadership deeds in heading the Society's renowned International Conference in 1959 that enriched world knowledge in electroplating, metal finishing, organic coating and allied arts through 43 papers delivered by experts of nine countries.

A Past President of the AES; Chairman of the International Council on Electrodeposition and Metal Finishing; Chairman of Project No. 15 of the AES's Research Program; long a Delegate of the Detroit Branch to name a few of his numerous other services to the Society over a span of many years, Mr. Pinner is an executive of the McGean Chemical Company of Cleveland, Ohio.

SECOND WILLIAM BLUM LECTURE DELIVERED BY DR. A. K. GRAHAM

Dr. A. Kenneth Graham, second AES Scientific Achievement Award winner, delivered the second annual "William Blum Lecture," a feature of the AES's 47th Annual Convention.

He presented, "Faraday's Laws Applied to Cleaning" and was honored immediately after the lecture by the awarding to him of a handsome scroll, plus a $500 honorarium, by National President Ralph D. Wysong in behalf of a grateful and admiring AES. Dr. William Blum himself served as Session Chairman.

REMINDER TO BRANCHES

1. **The due-date for all Branch Per Capita Tax payments for the 1960-1961 fiscal year (July 1-June 30) is September 1, 1960.**
2. **No Branch will be eligible for 1960-1961 Per Capita Tax refund or credit for any members resigned, suspended or deceased, unless proper notification of such resignation, suspension or demise exists from the Branch at National Headquarters on or before November 1, meaning before the issuance by the National Office of copies of the current year's TECHNICAL PROCEEDINGS.**

Boston's Statler-Hilton: Site of AES's 48th Annual Convention, June 1961.

BOSTONTOWN AS HOST OF AES'S 1961 NATIONAL ASSEMBLY

Responsible for the arrangements and success of the 48th Annual Convention of American Electroplaters' Society, Inc. (AES), is the Society's Boston Branch, a forty-year old AES veteran that, during its own Branch Fortieth Anniversary, will be conducting its third Annual Convention for the AES.

Under the leadership of Convention General Chairman Louis V. Gagnon, supported by a strong group of colleagues and associates, the Boston Convention will be held in historic Boston's Statler Hotel, June 18–23, 1961. It is being planned and programmed to outshine even the successful AES Boston Conventions of 1941 and 1950.

In keeping with the Society's perpetual and concentrated emphasis upon enriching knowledge in electroplating, metal finishing, organic coating and allied arts, the principle stress of the Convention will be its Educational Sessions Program. Under the eye of the AES Editorial Board, Host Branch Educational Sessions Chairman George J. Marrota and his talented associates of Boston are constructing a formidable four-day series of such sessions.

The Boston Convention will not only feature the third annual "William Blum Lecture," to be delivered by Dr. Charles L. Faust, third winner of the AES Scientific Achievement Award, but also a two-session, eight-paper "Finishing of Light Metals" Symposium being created for it by Dr. G. H. Kissin of the Kaiser Aluminum & Chemical Corp. of Spokane, Washington.

Off-duty hours will be brightened at the Boston Convention by an ambitious program of entertainment, relaxation, fellowship and fun, including a heralded Ladies Program. So plan now to be among those present when AES converges upon hallowed Bostontown in mid-June '61.

AES LAPEL BUTTONS

The AES members handsome silver lapel button can be purchased from your Branch Secretary at $1.38 per button.

SUGGESTIONS AS TO THE PROGRAMMING AND CONDUCT OF AES BRANCH EDUCATIONAL PROGRAMS FROM THE AES PUBLIC RELATIONS COMMITTEE AS AMENDED BY THE EXECUTIVE BOARD, APRIL 8, 1960

1. A good conscientious Branch Librarian is a "must" to maintain a satisfactory speaker program for Branch Educational Sessions.
2. An Educational or Speakers Committee headed by the Branch Librarian is suggested.
3. More reference should be made to the AES's Branch Officers' Manual by the Librarian and other persons instrumental in the Speakers Program.
4. Selection of speakers, their acceptance and the finalizing of a program should be done, to the utmost extent possible, by the September meeting for the Branch's Educational Sessions program through the Winter, Spring and up to Summer.
5. The Branch Librarian should poll the membership as to its interest in topics.
6. More care should be exercised in the choosing of Branch speakers with respect to topic and its interest to that specific Branch and its audiences. Example: Why schedule a speaker on rack coatings when the majority of the Branch's members are engaged in barrel plating.
7. Topics should, therefore, be of definite and immediate interest to that specific local Branch audience. The more general or technical presentations should be reserved for Branch annual or for regional or national meetings.
8. The level of Branch speakers should be geared to the understanding level of Branch audiences.
9. Effort should be made to obtain speakers who have no commercial connection with the topic in order to insure objectivity.
10. Speakers' subject should be educational invariably, never commercial.
11. Cooperation with other technical Societies is desirable. Joint meetings help provide top speakers and best attendance.
12. Small Branches are urged to invite guests so as to build speaker audience thereby warranting acceptance by speakers of the Branch's invitation to address such meetings.
13. The speaker and his topic should be effectively advertised before the meeting. Publicity should include direct mail to the membership, newspaper notices and notices through other technical Societies. Picture and background information on the speaker should be included. Personal contact via a telephone committee to stimulate membership attendance is effective.
14. The Branch Librarian should meet the speaker on his arrival, take him to dinner, introduce him to all Branch Officers present at the meeting, and send him a letter of thanks later.
15. The Business Meeting should either be very short or the speaker introduced as the first order of business. Too often, he is required to start at a late hour when the audience is restive and nonreceptive, a gross discourtesy.
16. Having refreshments at the close of a meeting is a good attendance booster.

OPPORTUNITY TO AUTHORS INTERESTED IN BOSTON CONVENTION PARTICIPATION

Emphasis being placed in programming the AES's Annual Convention to occur in Boston, Massachusetts, June 18-23, 1961, is upon creating an educational program so significant and appealing, that few persons seriously interested in educational enrichment in electroplating, metal finishing, organic coating and other such subjects can afford to miss it.

Members or non-member authors of original, unpublished technical and scientific papers on electroplating, metal finishing, organic coating and allied arts wishing to be considered as prospective participants in that Boston educational program are cordially invited to communicate either with Host Branch Educational Chairman George J. Marotta direct (Address: 91 Argilla Road, Andover, Massachusetts) or through the Editor of PLATING MAGAZINE, 443-445 Broad Street, Newark 2, New Jersey.

The Editorial Board will consider the preliminary program at its meeting in September 1960. You are consequently urged to record your availability with Mr. Marotta forthwith. State your subject (and send a preliminary abstract if possible) but please do not submit any manuscript until after the full particulars as to specifications have been sent to you.

AUGUST P. MUNNING, INDUSTRIALIST AND MFSA SECRETARY, EXPIRES

The industry in its respective classifications has been saddened by the death, on June 30, 1960, of August Peter Munning, a ranking executive of Munning & Munning, Inc., Newark, N. J. manufacturers of electroplating equipment and supplies and, concurrently, Executive Secretary of the Metal Finishing Suppliers' Association (MFSA). Son of Mr. and Mrs. Peter P. Munning and beloved husband of Mrs. Regina Heffernan Munning, all of East Orange, N. J. and all surviving him, the industrialist, so widely known affectionately as "Gus," expired in St. Barnabas Medical Center, Newark, following a long illness.

In the large reception room of the Joseph W. Preston Funeral Home in South Orange veritably transformed into an arbor by the floral offerings of relatives and friends, a large number of industry leaders and business and personal friends paid their last respects to the deceased over that Fourth of July weekend. The funeral occurred in the forenoon of July 4 at Our Lady Help of Christians Church in East Orange where a Solemn Mass of Requiem was offered. He was then interred in St. Joseph's Cemetery in Keyport, N. J.

Born in Chicago, Illinois in 1898 Mr. Munning attended the University of Chicago and received both his BS and MS degrees in Chemical Engineering at the Massachusetts Institute of Technology. After service in the Army artillery in World War I; later as a Chemical Engineer of the E. I. duPont deNemours Co.; later as President of A. P. Munning & Co.'s plant at Kobe, Japan, he thereafter served the present company, Munning & Munning Company, to his death. During World War II, he was associated with the War Production Board.

A member of a number of business, professional and other organizations, he was particularly prominent in the origin, growth and development of MFSA, the industry's trade association. He was a Past President of MFSA and, for years to his demise, later served as its Executive Secretary and one of its most dedicated and devoted leaders. A long-time member of the Newark Branch of American Electroplaters' Society, Inc. (AES), too, he was a tower of strength, during his lifetime, in the cementing of the splendid existing relationship between AES and MFSA.

Aside from his wife and parents, Mr. Munning is survived by two daughters, namely Mrs. John R. Noyes of Glen Ridge and Mrs. Cornelius Luehs of Cedar Grove; by his brother, John A. Munning and by his sister, Miss Pauline M. Munning.

August P. Munning

In Memoriam
AUGUST PETER MUNNING

WHEREAS, the late August Peter Munning, industrialist, scion of a metal finishing pioneer family, was for several decades to his death, actively associated with the management and operation, and development and growth, of a prominent business company, Munning and Munning Co., serving as a metal finishing source of supply to electroplaters and metal finishers.

WHEREAS, the decedent, during his business career, was additionally active in fostering high standards of metal finishing industry policies and practices, and trade and public relations, and did earn respect by his leadership and deeds as a founder, as a President, and later as long-time Executive Secretary and a bellwether of the Metal Finishing Suppliers' Association (MFSA).

WHEREAS, said deceased, long a member concurrently of American Electroplaters' Society, Inc. (AES), did also contribute to the Society's progress and to its educational accomplishments in stimulating advancements in electroplating, metal finishing and allied arts, and did himself play a prominent role in cementing the cordial and effective existent relationship between AES and MFSA.

BE IT THEREFORE RESOLVED THAT the Executive Board and National Officers of AES do hereby record their grief and that of the Supreme Society, its chartered Branches and Regional Councils, and AES members generally, over the passing, on June 30, 1960 of said AUGUST PETER MUNNING.

AMERICAN ELECTROPLATERS' SOCIETY, INC.
Ralph D. Wysong, President
W. Andrew Wesley, First Vice President
Chester G. Borlet, Second Vice President
Manuel Ben, Third Vice President
Herberth E. Head, Past President
John P. Nichols, Executive Secretary

MEMPHIS-MIDSOUTH CHARTERED AS AES's 59TH BRANCH

The Memphis-Midsouth Branch, after a required probationary period of several months as a temporarily chartered Branch of American Electroplaters' Society, Inc., was granted a Permanent Charter by the Executive Board at the Board's meeting held in Los Angeles, July 24, 1960.

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SAMPSON W. FREESTONE JOINS PLATING MAGAZINE STAFF

As an element of its planned development, long-range as well as immediate, PLATING MAGAZINE is happy to announce the recent appointment of Sampson W. Freestone as its Advertising Manager.

To his new position, Mr. Freestone brings an advertising space sales record spanning nearly twenty years with the New York Journal of Commerce alone, some six as Advertising Manager of its Textile Section with emphasis upon special feature issues. As a plus, he has had some four years' diverse experience in trade show sales and publicity.

He was a Business Administration major at St. John's University. During World War II, he served in the Counter Intelligence Corps with rank of Captain.

S. W. Freestone

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INTERSOCIETY NEWS

LINFORD CHOSEN AS ACHESON MEDALIST

Dr. Henry B. Linford, professor of chemical engineering at Columbia University, New York, N. Y., has, by unanimous action of the board of directors of The Electrochemical Society, Inc., been selected as the 1960 recipient of its Edward Goodrich Gold Medal and $1000 Prize. The presentation will take place at the Society's banquet which will be held in conjunction with its fall meeting in Houston, Texas, October 9–13, 1960.

This award, which was founded by the late Edward Goodrich Acheson in 1928, is made biennially for conspicuous contributions to the advancement of any of the objects, purposes or activities of the Society.

A member of The Electrochemical Society since 1936, Dr. Linford served as chairman of its New York Section in 1942 and chairman of its Electrodeposition Division in 1948. He held the post of secretary of the Society from the spring of 1949 to the spring of 1958, when he took office as vice president for a three-year term. Dr. Linford has also been nominated as the unopposed candidate for president of the Society for the year 1961–1962.

Organizations with which Dr. Linford is affiliated include: American Chemical Society, American Institute of Chemical Engineers, American Electroplaters' Society, National Association of Corrosion Engineers, Fellow of the New York Academy of Sciences, and The Chemists Club. He is also a member of Alpha Chi Sigma, Phi Lambda Upsilon, Sigma Xi.

♦

NACE CONFERENCES ON PROTECTIVE COATINGS

Four symposia and five technical committee meetings on protective coatings will be held during regional meetings of National Association of Corrosion Engineers this fall. Meetings where paints and protective coatings will be discussed are: Southeast Regional Conference, Atlanta, Ga., Oct. 6–8; Northeast Regional Conference, Huntington, W. Va., Oct. 11–14; South Central Regional Conference, Tulsa, Okla., Oct. 25–27.

More information on these conferences may be obtained from National Association of Corrosion Engineers, 1061 M & M Bldg., Houston 2, Tex.

♦

PLASTICS SOCIETY CHARTERS 45TH SECTION

Presentation of a charter by George W. Martin, president of the Society of Plastics Engineers to the Society's new Arizona Section at its meeting in Casa Grande, Arizona, on June 8 brings to 45 the number of SPE Sections now organized in the United States, Canada, Mexico and Japan. Current membership of the Arizona Section includes 39 engineers located primarily in the Phoenix-Tucson area, although the Section encompasses the entire state.

Officers of the new Section are: president, Samuel Windman, Phoenix Plastics, Phoenix; vice president, Ted W. Kerr, Arizona Plastics Extrusion Co., Phoenix; secretary, Don H. White, University of Arizona, Tucson; treasurer, Alan C. Bennett, Phoenix; and councilman, John Chesson, The Swanson Co., Phoenix.

♦

LA QUE URGES BROADER USE OF ASTM STANDARDS

Technical assistance to underdeveloped countries, in the form of ASTM standards, would provide a wealth of information on materials not available in any other form, and would be a sure way to put international trade in materials on a sound base. These points were made by F. L. LaQue, retiring president of the American Society for Testing Materials, at the President's Luncheon June 28 during the 63rd Annual Meeting of ASTM, in Atlantic City, N. J.

In outlining the already international scope of ASTM, Mr. LaQue, who is vice president for development and research of The International Nickel Company, New York, cited as evidence the facts that the Society now has members in more than 50 foreign countries; that in 1959 it received more than 9000 orders for publications from more than 65 foreign countries, from Afghanistan to the Windward Islands; that for some time it has been making substantial contributions to the work of the International Standards Organization, through the American Standards Association.

"Our government is committed to a policy of providing technical assistance to other countries, and particularly to what are called 'underdeveloped' countries," said Mr. LaQue. "In the field of materials, the 14,359 pages in the ten volumes of ASTM standards comprise the greatest concentration of immediately and practically usable information that it would be possible to furnish anyone needing such data . . . In most cases, no further work or search for data should be required to characterize a material needed for some specific purpose, whether it be concrete for a wall, steel for a bridge, or fuel for an engine."

New Officers for 1960-61

The election of new Society officers was announced during the luncheon. A. Allan Bates, vice president of research and development, Portland Cement Association, Chicago, was elected president of ASTM to serve for a one-year term beginning at the close of the meeting. Russell Wade Seniff, manager of research, Baltimore and Ohio Railroad, Baltimore, Md., was elected vice president. Miles N. Clair, president, The Thompson & Lichtner Co., Brookline, Mass., will continue as senior vice president of the Society. New members of the board of directors elected for three-year terms were: Arthur R. Belyea, chief chemical engineer, Consolidated Edison Co. of New York, Inc., New York City; Leslie V. Cooper, manager, Miscellaneous Products Development, Firestone Tire and Rubber Co., Akron, Ohio; Jay C. Harris, assistant director of research, detergents, Research and Engineering Division, Monsanto Chemical Co., Dayton, Ohio; Jerome J. Kanter, directing engineer, materials engineering, Crane Co., Chicago, Ill.; Robert F. Legget, director, Division of Building Research, National Research Council of Canada, Ottawa, Ont.; William R. Willets, assistant manager, Technical Service Laboratories, Titanium Pigment Corp., New York City.

Approximately 3000 members, committee members, and guests attended the 37 technical sessions being held by the American Society for Testing Materials (ASTM) at its week-long meeting. In addition, about 60 of its 80 technical committees held upwards of 900 committee meetings during the week. Topics ranged from the most basic of research in materials sciences to the most practical aspects of engineering design and construction.

PRODUCTION ENGINEERING AND MACHINE TOOL CONCURRENT SHOWS

Automation, the key to manufacturing during the 1960s, will be the theme of most exhibits at the Production Engineering Show.

The exposition, twice the size of the one held five years ago, will cover both sections of Chicago's Navy Pier and will run concurrently with the Machine Tool Show at the International Amphitheatre, September 6 through 16.

The Machine Tool Show is sponsored by the National Machine Tool Builders Association. The Production Engineering Show is presented by agreement with the association but is independent of it.

The $10,000,000 exhibit at Navy Pier will show the equipment and products which keep machine tools running. Control equipment of every conceivable type, machine components, auxiliary equipment and supplies, intraplant communications, safety equipment, materials handling equipment, inspection and gaging equipment, testing equipment, and dozens of types of special production equipment will not only be shown but demonstrated under simulated factory conditions.

The 125,000 expected visitors will thus have an opportunity to see the machine tools in operation at the International Amphitheatre and see the equipment which makes the tools run—and maintains them—at Navy Pier.

The physical separation of the two shows was made necessary because there is no exposition hall in the country which can house them both at one time. Because they are held only twice in each decade, top executives from every civilized country converge on Chicago to see the exhibits.

♦

NAMF ACCEPTS GROUP LIFE INSURANCE PLAN

Another forward step by the National Association of Metal Finishers (NAMF) was reportedly taken recently when its Board of Directors accepted a proposed plan for group life insurance for NAMF members.

According to NAMF's announcement, the plan is to be underwritten by the New England Mutual Life Insurance Company of Boston, Mass. All phases of the plan will be completed by Joseph H. Lackey, CLU, of the William H. McCoy Co., Detroit, Michigan, employee benefit plan consultants. A result of a two year study, the plan will reportedly become effective as soon as 350 persons are signed up.

♦

COPPER RESEARCH TO EXTEND ITS USES

Contracts for four research investigations and a technical publications program designed to find and promote uses for copper have been let by the Copper Products Development Association.

The research investigations, all of which are under way, are:

"Development of Tarnish-Resistant Copper by Metallurgical Surface Treatment," also awarded to Battelle Memorial Institute.

"Protection of Copper by Organic and Inorganic Films," awarded to the British Non-Ferrous Metals Research Association, London.

"Determination of Increased Uses for Copper and Copper Alloys in the Transportation Industry," awarded to the Southwest Research Institute, San Antonio, Texas.

"An Engineering Survey for New Uses for Copper in the Construction Industry," awarded to Battelle Memorial Institute, Columbus, Ohio.

The contract for the technical publications program was let to Clyde Williams and Company, Columbus, Ohio, a research and industrial management advisory firm.

The studies are first of a series the Copper Products Development Association will sponsor in research effort to extend markets for copper, copper alloys, and brass and bronze mill and foundry products. Negotiations are currently under way for additional studies, and, with the completion of the engineering surveys, a comprehensive, long-range program of research and development will be outlined.

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Rhodium electroplate is suggested for these applications: on wave guides and microwave equipment which may be used in marine atmosphere; in printed circuits; in electrical contacts where light contact pressure and low voltages are involved... Rhodium is very hard and corrosion-resistant.
This Rhodium plating solution is easy to use. It operates over a wide range of temperature and current densities. We will be glad to plate samples without charge.
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INDUSTRY NEWS

ADOLPH PLATING BUYS UNITED

The Adolph Plating, Inc., has purchased the United Plating Corp., 4600 West Palmer St., Chicago, according to Robert L. Giesel, Adolph president. With the acquisition of this plant, Adolph adds more than 41,000 sq ft of custom electroplating and enameling facilities to its properties, totaling an overall occupancy of approximately 100,000 square feet of floor space.

Organized just 13 years ago, Adolph Plating, Inc. now is reported to be the largest custom metal finishing establishment in the Chicago metropolitan area, maintaining 12 short-wave, radio controlled trucks.

COATED ABRASIVES LOCATES IN DETROIT AREA

Coated Abrasives, Inc., has transferred its manufacturing and headquarters operations from Milwaukee to the Detroit Metropolitan area. The company manufactures a full line of abrasive specialty items and engages in coated-abrasive application research.

The company's new manufacturing plant is located in Warren, Michigan. General staff offices are at 11920 East Eight Mile Road, Detroit 5, Michigan.

♦

PRECIOUS METALS REFINING CORP. NEWLY FORMED

The formation of Precious Metals Refining Corp. by the principals of Sel-Rex Corp., Nutley, New Jersey, has been announced by Morris M. Messing, president. The new company has been situated in a separate building encompassing nearly 10,000 square feet, immediately adjacent to Sel-Rex's executive offices.

According to the announcement, since the manufacture of the patented Sel-Rex precious metal plating processes requires ultra-high purity salts of the various metals, unique refining techniques were developed. These were reportedly eventually utilized in the refining of spent solutions and precious metal plated scrap for Sel-Rex customers. According to Mr. Messing, even though this service was never actively promoted, the demand grew to such proportions in a relatively short period of time that it was decided to form a separate company to accommodate it.

Staffed by precious metal refining specialists, Precious Metals Refining Corp. is said to be equipped with custom-designed scientific equipment for quick processing with greatest possible yields.

♦

NEW NAME FOR O'DONOHUE

C. F. O'Donohue, president of O'Donohue Sales Co., 3818 North Hubbard Street, Milwaukee, announces a change in the company name to O'Donohue Industries, effective June 1, 1960. The firm distributes chemicals, equipment, and supplies.

♦

HAMPDEN CHEMICAL OPENS IN PHILADELPHIA

Hampden Chemical and Equipment Co., a wholly owned subsidiary of Hampden Color and Chemical Co., Springfield, Massachusetts, recently opened its doors at Juniata and Richmond Streets, Philadelphia.

City officials taking part in the opening ceremony included Councilmen Michael J. Towey and Harry P. Carr and Peter Schauffler, Deputy Director of Commerce for Administration. Lewis Arnold represented the Philadelphia Industrial Development Corp.

Also attending the ceremony were the top officers of the 108-year-old New England firm, whose decision to establish a processing and distribution center in Philadelphia was welcomed by Frederick R. Mann, City Representative and Commerce Director.

Representatives of Hampden included Richard G. Woolworth, chairman of the board; John E. Costigan, president; Kenneth W. Clayton, vice president; Theodore Cox, secretary; Mrs. Hazel D. Baker, treasurer; Otto R. Kuhn, pur-

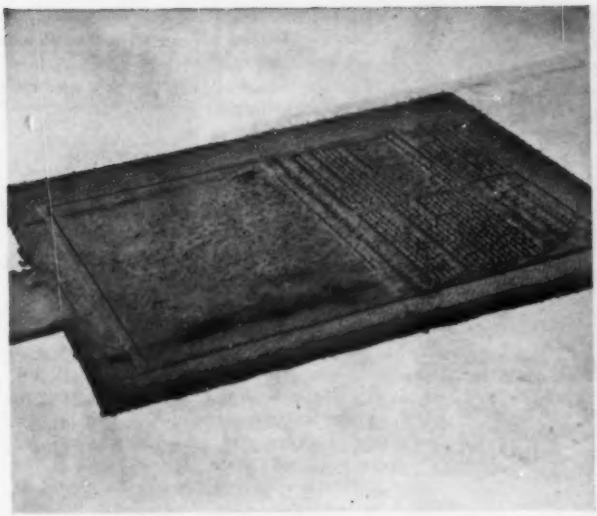
Detroit expanded electroplating analytical and technical services laboratories of Metal & Thermit Corporation.

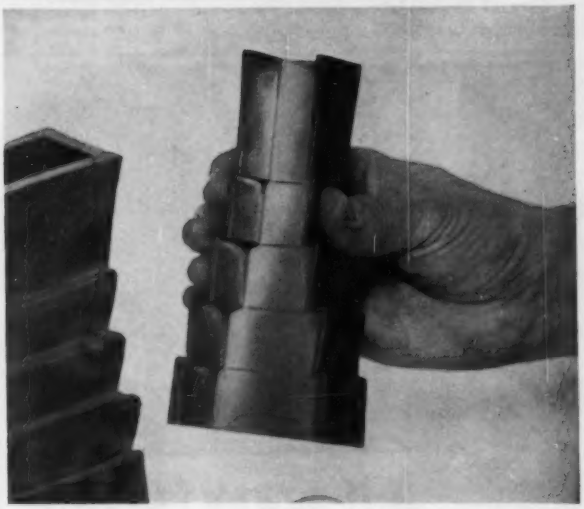
LABORATORY FACILITIES INCREASED BY METAL & THERMIT

Establishment of new and enlarged laboratory facilities in Detroit for electroplating analytical and technical services has been announced by Metal & Thermit Corporation.

According to Henry Mahlstedt, plating products manager for the company, Ronald Dow, manager of the plating technical service department, is now responsible for both M&T customer service and the new technical service and analytical laboratories. Peter G. Kenedi, formerly with the company's research laboratories at Rahway, New Jersey, is laboratory supervisor.

The field service laboratory headquarters a technical staff qualified in application of M&T Unichrome plating chemicals. These men also are available for field consultation in customer plants on electroplating problems. The extensive electroplating laboratories house such new equipment as a recording spectrophotometer colorimeter, photomicroscope (up to 1200 × magnification), micro-metallograph, electronic thickness gauge, micro-hardness tester, and fatigue tester. In addition, the laboratory is equipped with fume hoods, special heating ovens, three thermo-regulated water baths, automatic titrating equipment, and other apparatus necessary to provide complete service facilities.





In electrotyping, plating rotogravure rolls, electroforming, "Plus-4" Copper Anodes cut plating costs

ELECTROTYPERS have discovered that, in addition to eliminating the use of bags and diaphragms, they can place "Plus-4" (Phosphorized Copper) Anodes closer to the cathodes to speed up the plating cycle 30% or more with the same power input – and still obtain a smooth deposit. As an alternate, power can be reduced by one-third with an equal reduction in resistance and generation of heat to obtain finished electros in the same plating time. This is an important advantage when thermoplastic plates or molds are used and tanks must run no higher than 95F.

MAKERS OF ROTOGRAVURE ROLLS have found that "Plus-4" Anodes provide a much finer, smoother surface for polishing and etching, and retain the quality of the light tones in runs of over one million impressions on a single set of design cylinders.

In addition, they report significant reductions in cost. One publisher found that he produces superior rolls with less labor and a reduction of 18 to 20% for materials required in the plating process. Another reports he gets a dividend of eight extra rolls for each tank load of "Plus-4" Anodes. And still another has found a 15% saving in over-all costs.

IN ELECTROFORMING operations, "Plus-4" Anodes – by eliminating the most prevalent acid-copper plating difficulties – have made it practical to produce many new products. Their ability to provide a smooth, dense deposit relatively free from growths and blemishes made possible relatively thick shells for molds used in making rubber and plastic articles, and in intricate precision parts for electronic use. Electroformers report operating economies similar to those found in the graphic arts field.

WRITE FOR INFORMATION on how you can obtain a test quantity to supply one tank. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass, Ltd., New Toronto, Toronto 14, Ontario. 89106

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"PLUS-4"® ANODES Phosphorized Copper

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chasing engineer and Callan England, a member of Hampden's board and a vice president of the First Penna. Banking and Trust Co.

The purpose of the company is to sell a complete line of chemicals, processes and equipment to the metal finishing trade as well as handle heavy chemicals for general distribution in Pennsylvania, Delaware, Maryland and New Jersey. The firm has been named a distributor for the plastic laboratory apparatus of the Nagle Co., Inc.

♦

NEWARK BRANCH MEMBERS FLY COMPANY PLANE

General Magnaplate Corporation of Belleville, New Jersey, maintains a four-place, single engine Beechcraft Bonanza at Teterboro Airport, Teterboro, N. J., expressly for the purpose of providing fast service with its testing facilities.

General Magnaplate is basically a non-destructive testing laboratory for testing

materials, products and components. It also specializes in electroplating, coating, metal treatment and related industrial finishing operations.

Charles P. Covino, air-minded president and chief engineer of General Magnaplate, and a member of Newark Branch, AES, started his business flying in 1953 when out-of-state trips became frequent. Plant superintendent Arthur J. Seuffert also flies the Bonanza. He, too, is a member of Newark Branch.

♦

ACME EQUIPMENT TO BE MARKETED IN ENGLAND

A new company named Acme-Efco Ltd., has been formed to market the complete line of Acme polishing and buffing machines. Acme-Efco Ltd., is owned jointly by Acme Manufacturing Co., of Detroit, Michigan, and Electro-Chemical Engineering Co., Ltd., of Sheerwater, Woking, Surrey, England, one of the leading automatic electroplating equipment manufacturers and plating process development companies in England for more than 21 years.

The new company has been established to manufacture and sell to the English industrial and metalworking market the complete line of Acme machines.

♦

To prevent mist and spray from rising out of the plating tank, The Udylite Corporation has developed Zero-Mist pills. These tablets look and fizz like bicarbonate of soda.

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. . . when you use the BARRETT SULFAMATE NICKEL PLATING PROCESS, the only nickel plating process which is essentially stress free as measured by the contractometer. Only BARRETT SULFAMATE NICKEL eliminates peeling, cracking, warping, blistering, distortion, shrinkage and premature fatigue failure of the base metal when due to high tensile stress. Complementing this major advantage, the BARRETT SULFAMATE NICKEL PLATING PROCESS also has superior throwing power and ductility, in a plating solution that arrives at your plant "ready-to-operate." Further technical data available upon request for bulletin SN-1. Stress measuring contractometer also available.

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INDUSTRY NEWS BRIEFS

NEW BERYLLIUM ORE DISCOVERY IN UTAH

A significant deposit of a new beryllium ore has been discovered in the Topaz Mountain area of Utah, approximately 150 miles from Salt Lake City.

Beryllium is now being used in the nuclear, missile and space industries because of its unusual properties of high strength and light weight. However, development of the beryllium industry has been limited by its short supply and high cost. Beryllium is now produced from the mineral beryl, which is picked by hand from pegmatite formations.

Officials of Vitro Minerals Corp., one of the largest claim holders in the Topaz Mountain area, said the new ore is found in disseminated non-pegmatitic deposits, much of it lying close to the surface where it can be mined by modern open-pit mining techniques. Studies by Vitro Minerals specialists indicate the new ore is readily soluble in sulfuric acid and is apparently amenable to conventional hydro-metallurgical processing.

♦

PRODUCTION MACHINE BECOMES DIVISION OF WANSKUCK

John A. Wilson, president of the Wanskuck Co., Providence, R. I., announces that his company has purchased the Production Machine Co., Greenfield, Mass. The firm, employing about 60, will continue to operate in Greenfield with its existing personnel. Anthony J. Spada has been appointed general manager of the firm to replace the late Raymond A. Cole.

The Production Machine Co. produces grinding, polishing and buffing machines using abrasive belts. Its acquisition is the third by the Wanskuck Co. since this textile manufacturer was purchased by the New England Butt Co. of Providence in 1955.

♦

NEW CANADIAN ULTRASONIC FIRM

Ultrasonic Industries, Inc. of Albertson, L. I., New York, has announced the formation of a Canadian subsidiary, Ultrasonic Industries (Canada) Ltd., 1512 Eglinton Avenue West, Totonto, Ontario, the first of several such companies contemplated by UI in the development of international markets for its diSONtegrator ultrasonic cleaning equipment and other ultrasonic devices.

UI (Canada) is the first company exclusively devoted to ultrasonics to be incorporated in Canada. Initially, the Toronto based company will direct the marketing, distribution and service activities for its parent U. S. company in Canada's rapidly expanding technical economy.

♦

NEW BUILDING OF GARFIELD BUFF AND NEWLY ACQUIRED HARDALE

Garfield Buff Co. has acquired Hardale, Inc. manufacturers of conventional buffing wheels and wire brushes. The announcement was made by Samuel Ludsin, Garfield Buff president. Hardale, Inc. was organized in 1948. The machinery and equipment has been moved to Garfield Buff's new and larger modern building, 62 Clinton Road, Caldwell, N. J., where it is now in operation. Hardale will operate as an independent unit. Allan H. Friedel is vice president in charge of sales.

For Metal Finishers!

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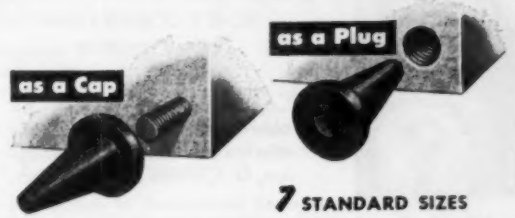

7 STANDARD SIZES

	A	B	C	D	E	F	G
TO PLUG HOLE SIZE	1/8-3/16	3/16-1/4	1/4-5/16	5/16-1/2	1/2-5/8	9/16-11/16	5/8-3/4
TO CAP STUD SIZE	3/32-5/32	5/32-3/16	3/16-1/4	1/4-5/16	5/16-3/8	3/8-7/16	5/16-1/2

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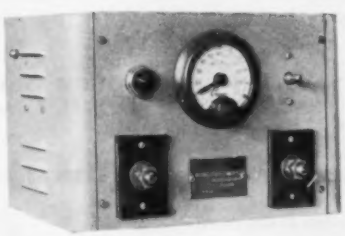

How It Works:

Connect in the cathode line, plug into 115V AC source, set timer, and put MACARR PMC "on"—Insertion of work on cathode rod of any amperage between 2 and 150 will automatically start timer, will time for preset interval. Simultaneously at this point a visible and audible alarm operates; also current to work is automatically reduced to a level where it is not plating or deplating. Removal of work resets PMC and it is ready for next load without the operation or manipulation of any switches.

PMC-150 Model—2-120 second time range with 2A to 150 current rating. Other models available with special time and current ranges.

Write for descriptive literature

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USE READER SERVICE CARD; INDICATE A 825.

PATENT ABSTRACTS

DR. D. GARDNER FOULKE

SEL-REX CORPORATION
Nutley, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

2,923,608, 2/2/60—STEEL SURFACE TREATMENT—P Margulies, assignor to Food Machinery & Chemical Corp. San Jose, California.

To improve the bonding properties of mild steel surfaces treat with a solution containing 20–65 per cent water, 5–30 per cent H_2O_2 and 25–70 per cent of mineral acid, then rinse.

4 claims.

2,923,648, 2/2/60—DI-PHASE CLEANING SYSTEM—R. K'burg, assignor to E. I. dePont de Nemours & Co., Wilmington, Delaware.

A process and apparatus is described for cleaning articles by immersing through an aqueous phase into a solvent (heavier than water) phase and removing through the aqueous phase.

7 claims, figure.

2,923,670, 2/2/60—PURIFICATION OF PLUTONIUM—C. Bjorklund et al., assignors to U. S. (A.E.C.).

Deposit the plutonium from a fused salt bath at a temperature of 600C or below.

4 claims.

2,923,671, 2/2/60—COPPER PLATING ANODE—G. Van Tillburg, assignor to American Metal Climax, Inc., New York, N. Y.

The addition of 0.0001 per cent lithium to an OFHC copper anode is claimed to minimize anode sludge and provide a cathode deposit free of nodular growths.

4 claims.

2,923,672, 2/2/60—EXTRACTION OF CHROMIUM, MOLYBDENUM AND TUNGSTEN—G. Ervin & H. Ueltz, assignors to Norton Company, Worcester, Mass.

2,923,675, 2/2/60—ELECTROPLATING APPARATUS—John Round, Birmingham, England.

A barrel plating apparatus is described.

2 claims, figure.

2,924,229, 2/9/60—DEGREASER—T. Kearny and J. Nuber, assignors to Detrex Chemical Industries, Detroit, Michigan.

A degreasing apparatus for cleaning objects in solvent by racks moved in a circular path through the solvent is described.

7 claims, figure.

2,924,535, 2/9/60—SILVER FILM—V. Schaefer, assignor to General Electric Co., Schenectady, N. Y.

Coat the area with a solution containing polyvinyl alcohol and a water soluble silver salt, then heat to 75–200C to form a silver coating.

7 claims.

2,924,539, 2/9/60—WETTING COMPOUND FOR ANODIZED ALUMINUM—H. Arndt and H. Seiler, assignors to Midwest Mfg. Corp., Galesburg, Illinois.

Soak the anodized aluminum surface in a solution containing EDTA compound at 200 to 210F for at least seven minutes. This will provide a permanently wettable coating.

1 claim.

2,924,563, 2/9/60—ELECTROPLATING APPARATUS—W. Gray, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

An apparatus for continually plating glass sheet is described.

6 claims, figure.

2,924,564, 2/9/60—SELECTIVE PLATING APPARATUS—William Jackson, assignor to the Udylite Corp., Detroit, Michigan.

An apparatus having a plurality of work supporting means mounted for travel through a succession of liquid treating positions is described.

8 claims, figure.

2,925,358, 2/16/60—NON-ACID ELECTROLYTE—G. De Maio, G. P. Peteler, Miami, Florida.

A storage battery electrolyte consisting of 4 per cent magnesium sulfate, 1 per cent copper sulfate, 0.4 per cent of a non-foaming detergent, at least 10 per cent of alcohol and the rest water is claimed.

2 claims.

2,926,076, 2/23/60—ETCHING—W. Guenst, assignor to Master Etching Machine Co., Wyncote, Pa.

A method of etching a cylindrical printing plate using a chemical solution by direct impingement.

3 claims, figure.

2,926,111, 2/23/60—PROTECTIVE COATING—D. Schweitzer, et al., assignors to U.S.A. (A.E.C.).

To inhibit the corrosion of carbon steel by heavy liquid metals, react zirconium with the carbon, then maintain some zirconium in the heavy liquid metal.

11 claims.

2,926,123, 2/23/60—COATING—S. Simon and N. Katz, assignors to U.S.A. (Navy).

To provide a temperature reducing coating for high temperature alloys with at least 3 per cent iron, make said alloy the anode in a 2.2 *p*H phosphoric acid solution at 18 milliamperes/in² for 10 minutes, then heat to 1200C.

1 claim.

2,926,124, 2/23/60—TIN-NICKEL ALLOY PLATING—R. Taylor and R. Phillips, assignors to the Chrysler Corp., Highland Park, Michigan.

A bath for plating tin-nickel alloys is described as containing stannous-nickel chloride and hydrochloric acid at a *p*H below 1.0.

15 claims.

2,926,125, 2/23/60—COATING MAGNESIUM—J. Cuthbert et al., assignors to Canadian Industries, Ltd., Montreal, Canada.

To prepare corrosion resistant coatings on magnesium and magnesium alloys, immerse as the anode in a water solution containing an alkali metal borate (at least 0.05 per cent) and a peroxide substance such as H_2O_2 and peroxygen compounds (0.001 per cent) and electrolyze.

8 claims.

AES RESEARCH PROJECT REPORTS CURRENTLY AVAILABLE

Cleaning and Preparation of Metals for Electroplating, IV, V, VI & VII—By H. B. Linford & E. B. Saubestre — *Serial 26, Project 12, $3.50*

Methods for Testing Thickness of Electrodeposits, II & III—By H. J. Read & F. R. Lorenz — *Serial 27, Project 7, $1.35*

Porosity of Electrodeposited Metals—By N. Thon, D. G. Kelemen, L. Yang, S. Yang, D. Dean — *Serial 28, Project 6, 85 Cents*

The Analysis of Electroplating Solutions for Major Constituents—By E. J. Serfass & M. H. Perry — *Serial 29, Project 2, 90 Cents*

Effect of Basis Metal Condition on Plating, I & II By A. E. R. Westman & A. F. Mohrnheim — *Serial 30, Project 14, $1.10*

Effect of Surface Finishing on Nonferrous Base Metals on Protective Value of Plated Coatings—By G. J. Kahan, W. W. Macchia, J. M. Fairbank — *Serial 31, Project 4, 45 Cents*

How the Small Electroplater Can Treat Cyanide Plating Waste Solutions with Hypochlorites—By Bernett F. Dodge and Walter Zabban, Yale University, New Haven, Connecticut — *Serial 33, Project 10, 50 Cents*

Effects of Impurities and Purification of Electroplating Solutions, IX, X & XI—By Dr. D. T. Ewing, Dr. A. J. Smith & Dr. W. O. Dow — *Serial 34, Project 5, 50 Cents*

Cleanability and Oil Spreading Rates—By H. B. Linford & P. E. Grubb — *Serial 35, Project 12, 50 Cents*

The Nature, Cause and Effect of the Porosity in Electrodeposits, I & II—By Fielding Ogburn, Asaf Benderly and Margaret Hilkert — *Serial 36, Project 13, $1.00*

Microthrowing Power, A Literature Search—By Esther B. Leffler and Henry Leidheiser Jr. — *Serial 37, Project 17, 75 Cents*

The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating IV—By M. H. Jones, Chih-Yeu Lu and J. Zajdowski — *Serial 38, Project 14, $1.25*

Mechanical Finishing of Metal Surfaces—**Bibliography**—By C. E. Kennedy, J. E. Fritts, R. S. Modjeska, L. E. Weeg & R. V. Twyning — *Serial 39, Project 18, 50 Cents*

The Nature, Cause and Effect of the Porosity in Electrodeposits, III, IV & V—By Fielding Ogburn, D. W. Ernst & W. H. Roberts — *Serial 40, Project 13, 50 Cents*

An Introduction to Fundamental Research on the Mechanism of the Electrodeposition of Metals—By B. E. Conway and J. O'M. Bockris — *Serial 41, Project 16, $1.00*

Cleaning and Preparation of Metals Prior to Electroplating, VIII, IX, X & XI—By H. B. Linford, D. O. Feder & A. Venkateswarlu — *Serial 42, Project 12, $1.75*

Cleaning and Preparation of Metals Prior to Electroplating, XII—By H. B. Linford & J. J. Grunwald — *Serial 43, Project 12, 50 Cents*

The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating, VI—By M. H. Jones, Chih-Yeu Lu, A. F. Mohrnheim & J. Zajdowski — *Serial 44, Project 14, $1.50*

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Electrodeposited	39.50
BRASS, 80-20, ball anodes, 2000 lb or more	53.00
ZINC, ball anodes, 2000 lb lots (for elliptical add 1¢ per lb)	20.50
NICKEL, 99 pct plus, rolled carbon per lb (rolled depolarized add 3¢ per lb)	$1.0225
TIN, ball anodes, per lb, approximately	$1.05

(Cents per lb. unless otherwise stated, freight allowed in quantity)

Primary Metals

GOLD, U. S. Treas., per oz	$35.00
INDIUM, 99.9 per cent, per troy oz	$2.25
LEAD, New York, cents per lb	12.10
PALLADIUM, per troy oz	$24 to 26
PLATINUM, per troy oz	$82 to $85
RHODIUM, per troy oz	$137 to $140
SILVER, cents per troy oz	91.375

Chemicals

BORIC ACID, 100 lb bag N. Y.	12.10
CADMIUM OXIDE, 100 lb drum per lb	$1.50
CAUSTIC SODA, 100 lb, N. Y.	8.50
CHROMIC ACID, flake type, 100 lb drums	31.00
COPPER CYANIDE, 100 lb drum	65.90
COPPER SULFATE, 100 lb bags, per cwt	27.75
NICKEL CHLORIDE, freight allowed, 100 lb	45.00
NICKEL SULFATE, 5000 lb	29.00
POTASSIUM CYANIDE, 100 lb drum N. Y.	45.50
ROCHELLE SALTS, 100 lb	53.00
SODA ASH, 100 lb	9.10
SODIUM CYANIDE, domestic, f o b N. Y., 200 lb drums	23.80
SODIUM STANNATE, 100 to 600 lbs	70.70
ZINC CYANIDE, 100 lb	60.75

(Cents per lb, f o b at point shipped)

Prices in effect July 11, 1960

These prices, while derived from authentic sources, may be expected to vary by geographic location, quantity purchase, FOB and other terms, market influences and variations. They are presented solely as a general guide.

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2,912,989, 11/17/59—PLATING MACHINE—D. Borodin, assignor to Wagner Brothers, Inc., Detroit, Mich.

A plating conveyor is described.

20 claims, figure.

2,913,360, 11/17/59—DESCALING NICKEL ALLOYS—D. Zaremski and J. Beigay, assignors to Allegheny-Ludlum Steel Corp., Brackenridge, Pa.

Contact the surface of the article with an aqueous bath containing 5–30 per cent acetic acid, 0.5–17 per cent hydrofluoric acid, and 0.1–2 per cent titanium.

12 claims.

2,913,375, 11/17/59—PLATING CELL—R. Gilmont, Douglaston, N. Y.

A plating cell for control of plating electrolytes is claimed.

10 claims, figure.

2,913,376, 11/17/59—CONDITIONING COPPER PLATING SOLUTION—H. McLeod, assignor to E. I. du Pont de Nemour & Co., Wilmington, Del.

The use of potassium bromate in copper cyanide plating baths containing selenium whereby the selenide ion concentration is maintained at about 0.1 to 0.01 ppm is described.

3 claims.

2,913,377, 11/17/59—AQUEOUS ELECTROLYTIC PROCESSES—H. Brown, assignor to The Udylite Research Corp., Detroit, Mich.

The use of perfluoro-alkane sulfonic acids in anodizing baths to minimize spray formation is claimed.

6 claims.

2,913,378, 11/17/59—REFINING TITANIUM—R. Dean and W. Gullett, assignors to Chicago Development Corp., Riverdale, Md.

A fused salt electrorefining method is claimed.

See also 2,913,380, assigned by Gullett to the same company on refining titanium-vanadium alloys.

1 claim, figure.

2,913,379, 11/17/59—SEPARATION PROCESS—M. Steinberg, assignor to United States of America (AEC).

A fused salt electrolytic method is claimed to be applicable to the separation of niobium from tantalum.

See also 2,913,382 describing a fused electrolyte for use in making alkaline earth metals with 2 claims.

6 claims.

2,913,383, 11/17/59—JET-ELECTROLYTIC METHOD FOR CONFIGURING BODIES—A. Topfer, assignor to Philco Corp., Philadelphia, Pa.

A jet method wherein a jet of solution is directed toward semiconductor bodies (Ge, As, Sb) while current is passed is described.

7 claims, figure.

2,913,856, 11/24/59—BUFFING WHEEL—E. Carlton; Toledo, Ohio.

A finger-type buff is described.

2 claims, figure.

2,914,419, 11/24/59—COATING WIRE AND STRIP—K. Oganowski, assignor to Armco Steel Corp., Middletown, Ohio.

Continuously coating strand-like and strip material is done by moving said elongated material past a member with a lip.

See also 2,914,423, assigned to Armco by E. Knapp with 31 claims and figure.

29 claims, figure.

2,914,449, 11/24/59—GERMANIUM CONTACTS—S. Mayer, assignor to International Standard Electric Corp., New York, N. Y.

Low resistance electrical connections are claimed to be obtained to germanium by depositing metastable nickel stannide on the germanium by electroplating. Heat treatment at 250 to 300C releases tin over the germanium surface which is then soldered.

2 claims.

2,915,406, 12/1/59—PALLADIUM PLATING BY CHEMICAL REDUCTION—R. Rhoda and A. M. Madison, assignors to the International Nickel Co., New York, N. Y.

An electroless palladium plating bath is described as containing about 0.011 to 0.25 mole/l of divalent palladium, 0.002 to 0.05 mole/l of hydrazine, 0.005 to 0.25 mole/l of a stabilizing agent (aliphatic ketones, EDTA and derivatives, etc.) and ammonia or aliphatic amines.

21 claims.

2,915,414, 12/1/59—COPPER PLATING PROCESS—H. Hilemn, Mount Vernon, N. Y.

An immersion deposition process for copper on iron particles in an alcohol-glycerine solution is claimed.

5 claims.

2,915,417, 12/1/59—COATING OF URANIUM AND THORIUM—R. Potvin et al, assignors to Atomic Energy of Canada Limited, Ottawa, Ontario, Canada.

The deposition of arsenic on the surface of the uranium and thorium is described.

2 claims.

2,915,444, 12/1/59—CLEANING AND PLATING FERROUS METALS—Walter R. Meyer, assignor to Enthone, Inc., New Haven, Conn.

Claim 3 states: "The process of removing foreign matter including oxides of iron from ferrous metals which comprises subjecting the metals to electrolysis as the cathode in an alkaline aqueous solution having a *p*H of above 10.0 and containing an agent selected from the class consisting of alkali gluconate, alkali saccharate, ethylene diamine diacetic acid salts, ethylene diamine triacetic acid salts, ethylene diamine tetraacetic acid salts, hydroxy ethyl ethylene diamine triacetic acid salts, and triethanolamine said agents having the common property of complexing iron into soluble form, and being present in an amount of from about five grams per liter to saturation.

19 claims.

2,916,397, 12/8/59—ALUMINUM COATING—A. Chin et al, assignors to General Electric Co., New York.

Clean the metallic body, coat with an alkylolamine, then apply molten aluminum.

7 claims.

2,916,400, 12/8/59—GAS PLATING—H. Homer and O. Cummins, assignors to Union Carbide Corp., New York, N. Y.

The use of tetraisobutyl tin in the presence of dry nitrogen gas is claimed.

See also 2,916,398, describing gas plated, metallic adhesive tape with 2 claims and figure.

2 claims, figure.

2,916,423, 12/8/59—ELECTRODEPOSITION OF COPPER—F. Passal, assignor to Metal & Thermit Corp., Woodbridge, N. J.

The use of not less than 0.06 mole/liter of saccharate ion in a copper cyanide bath (to promote anode efficiency) is claimed.

16 claims.

(*Continued on page 974*)

Remittance must accompany all book orders placed with AES Headquarters.

Metallizing of Plastics. By Harold Narcus, President and Technical Director, Electrochemical Industries, Inc. 208 pp. (1960). Nonmembers $5.50, AES Members $4.75.

This little book comes on the scene at just the right time. For many years, the metallizing of plastics was largely (though never entirely) restricted to decorative applications. Since the end of WW II, however, engineering and functional uses for metallized plastics have increased rapidly, to a point where such uses will shortly dominate the field. Since most plastics are non-conductive, ordinary electroplating methods must be preceded by some special metallizing step, and this is the area which is treated in Dr. Narcus' book. For the first time, there are brought together under the covers of one book detailed, practical treatments of chemical reduction ("electroless") plating, vacuum metallizing, cathode sputtering, and other less widely used metallizing procedures.

Dr. Narcus is eminently qualified to write such a book, as he has not only devoted most of his professional life to a study of metallizing of plastics, but (and this is the acid test) has successfully created and developed a large job plating operation which deals solely in metallized plastics. A beginner, picking up this book, will be taken on what amounts to a detailed guided tour of two New England shops, one of which specializes in chemical reduction plating, the other in vacuum metallizing. Unusual for a book of this type, the author "tells all," sparing no details, and offering all sorts of practical advice and tricks of the trade. By the time he has laid the book down, the beginner ought to understand "what it's all about," and develop rather quickly practical skills in the art.

A book of this type must inevitably succumb to a common pitfall. The presentation is slanted in the direction of the author's personal industrial experience. Thus, the beginner, while receiving all the practical information required to get underway in this field, will necessarily acquire a slightly biased view of the art. To cite two examples, the formulas given for electroless silver and nickel plating, while excellent in their own right, are not representative of the most commonly used processes today. However, this slanting of the presentation is deliberate on the author's part, since, as he points out in the Introduction "a bibliography (of the subject) might tend to confuse the reader rather than . . . enlighten him." Thus, this book in no way supplants such thorough bibliographic reviews of the field as have been published in the past ten years by S. Wein, which remain the classics in their field.

In addition to covering about a dozen metallizing methods, the book discusses an important, but often neglected subject: formulas for electroplating solutions used after application of the initial metallized coating. Also covered are characteristics and testing of metallized coatings on plastics, recent developments in the field, and future potential uses for metallized plastics.

In the reviewer's opinion, this book is destined to be for the metallized plastics field what Blum and Hogaboom has been through the years for the electroplating field. One final note: this book is attractively priced, in these days of spiralling inflation in the cost of technical books. Reinhold is to be commended on its Pilot Book Series for the technical reader.

EDWARD B. SAUBESTRE
Technical Director
Enthone, Inc.
New Haven, Conn.

1959 American Society for Testing Materials

Proceedings, Vol. 59. 1424 pp. Nonmembers $12.00, AES members $11.00.

The 1424-page 1959 ASTM Proceedings, Vol. 59 records the technical accomplishments of the year, including reports and papers, together with discussions, offered to the Society during the year and accepted for the Proceedings. The volume includes the Summary of Proceedings of the ASTM 62nd Annual Meeting, June 1959, and the Summary of Proceedings of the Third Pacific Area National Meeting, September 1959, listing by title and author the programs for each session.

There are 71 reports of technical committees which, together with appendices, provide a wealth of useful information, as do the 44 technical papers and discussions on a wide variety of subjects pertaining to research and standards for materials. An important part of the Proceedings are the discussions not previously published which add to the value of the technical papers.

The annual report of the board of directors highlights matters administrative, technical, and financial and includes a record of meetings held by Society Districts, information on membership gains, publications, honors and awards, and other matters of interest.

Electropolishing, Anodizing and Electrolytic Pickling of Metals. By N. P. Fedot'ev (Professor of Electrochemistry, Leningrad Technological Institute) and S. Ya Grilikhes (Research Student) Moscow, 1957. Translated by A. Behr. 285 pp X (1959). Nonmembers $8.40, AES Members $7.50.

This book is noteworthy because it is probably the first Russian book on a metal-finishing subject to be translated completely into English. One may assume that its contents give an insight into the present state of the subject processes in Russian productive technology. On this basis, it appears that these processes are well understood in Russia, and, in the case of electropolishing, possibly more effective or widely used in a variety of industrial applications than is the case in this country.

The scope of the book is indicated by the following summary of the subjects covered:

A. **Electrolytic pickling** (25 pages). The presentation includes theory and reactions, simultaneous deposition of tin or lead in cathodic pickling, periodic reversal and ac, ultrasonic agitation during pickling, regeneration of pickling baths, effects of pickling on properties of metals, solutions for pickling various kinds of metals, anodic pickling for adhesion of electroplates, and special applications. While much useful information is given in this section of the book, it is obvious that in 25 pages these subjects cannot be extensively discussed.

B. **Electropolishing.** This is the most comprehensive section of the book. It comprises six chapters occupying 163 pages, which cover theory, electropolishing of steel, electropolishing of non-ferrous metals, effects of electropolishing on properties of metals, practical operating data, and descriptions of applications. For electropolishing steel, the discussion is almost wholly devoted to sulfuric acid-phosphoric acid baths, with and without added chromic acid. Brief reference is made to a few baths of other compositions. Many useful data are included, such as the effect of various operating conditions on anodic current efficiency and degree of smoothing. Procedures are described for regenerating spent baths for steel.

Decorative finishing, numerous applications for reduction of friction (for example, electropolishing of various parts of spinning machines over which the thread passes), electropolishing of cutting tools, electrolytic de-burring, and metallographic polishing are among the applications described.

C. **Anodizing.** Anodizing is covered in four chapters of 78 pages. The first of these chapters includes theory, mechanism of film formation, and properties of anodic films on aluminum, such as hardness, wear resistance, effect on fatigue strength of the basis metal, corrosion resistance, and dielectric properties. Most of the data is for films formed in the sulfuric acid anodizing bath. The second chapter is concerned mainly with industrial practice, and covers composition and control of the sulfuric acid, chromic acid, and

(Continued on page 973)

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EQUIPMENT AND SUPPLIES

E—801. SILICON DIODES—Completely new diffusion techniques have resulted in this first of a series of miniaturized 750 ma rated diffused junction silicon diodes featuring low reverse current (200 ua) at rated PRV, a much higher than average surge current rating (50 amps peak, 1 cycle) and an exceptionally low forward voltage drop (0.92 volts) at rated current.

Manufactured by International Rectifier Corporation, the new axial lead diodes are primarily designed for industrial applications where miniaturization and high power handling capabilities are required.

E—802. WHEEL HEAD—A new wide-face wheel head, specially designed for continuous buffing of aluminum, brass, or steel coil stock, has recently been added to Murray-Way's line of specialized polishing and buffing machinery and complete automatic production lines.

According to the corporation, these new heads are unique, in that they may be placed in tandem and angularly positioned for cross-cutting action. The complete head oscillates, allowing more uniform buffing, and a special jog automatic wheel positioner is provided to compensate for buffing wheel wear.

E—803. TUMBLING BARREL—Tumb-L-Matic, Inc. is offering a new barrel finishing unit for producing finishes on metal and plastic precision parts.

Designated Model XLC-2120, the barrel is mounted in a welded iron frame and supported in oversize bearings at each end of the shaft. The hexagonal barrel is 20 in. in diameter, 21 in. long and lined with ¼ in. thick neoprene.

Based on manufacturers' individual needs, the barrel is supplied unlined or with abrasive resistant rubber. It can be utilized for wet or dry processes.

Barrels are supplied with 2 types of drives. One type involves constant speed (set to user requirements) and the other is variable in a ratio of 10:1.

E—804. TARTRATE ADDITIVE—Cowles Chemical Co. is manufacturing a tartrate plating additive, called TPA, which is claimed to be a direct replacement for rochelle salts in bronze, brass, copper strike and copper plating solutions. TPA is a liquid concentrate which goes into solution instantly without fuming. The tartrate added this way provides more uniform anode corrosion and greatly increased cathode efficiency. It, therefore, helps produce finer grain and clearer brighter deposits. The use of TPA for the tartrate component of the electrolyte also reduces filtration frequency because the formulation also chemically ties up organic and metallic contamination. A 1 per cent solution is equivalent to 1 ounce per gallon of rochelle salts in direct substitution.

E—805. FINISHING MACHINE—A compact, portable precision finishing machine, Model RA4 Rollabrader, has been introduced by Rampe Manufacturing Co. for small-parts work. The machine processes four barrles at one time and has 20 to 46 rpm variable speed drive. Barrels are each two-quart capacity, with orange "No-Seam" vinyl plastic lining.

The machine is claimed to have a wide variety of uses including lapidary work, deburring and polishing of delicate parts, sample lots, and special process applications.

E—806. UNCUT RESINS—Uncut resins, direct from the cooking vat, that are claimed to be well suited for metallizing, have been announced by the Schwartz Chemical Co.

Adjustment of solids content and viscosity, by the user, permits the application of a high solids mix for uniform, high gloss on porous and rough die castings, or a very thin coating on smooth metal surfaces for the same type of finish.

E—807. THERMO-SET COATING—A new thermo-set coating for use on polystyrene, acrilic, phenolic and other plastic materials and products being vacuum metalized is available from John L. Armitage & Co. The thermo-set coating, it is claimed, provides a thicker film and superior wear and humidity resistance.

Designed for use on a wide variety of products including novelty jewelry, control knobs and cases for transistor radios, the coating is applied either by dipping or spraying. The base coat is baked for one hour at 150F, the product is vacuum metalized and the top coat then applied and baked for another hour at 150F.

E—808. COPPER PREPARATION PROCESS—A new process for preparing copper for electroplating, which is quick and simple to use and said to substantially reduce the porosity of thin electrodeposits, has been developed by Becco Chemical Division of Food Machinery and Chemical Corp.

The new plating prepare replaces the conventional acid pickle by a brief dip in a 25 per cent solution of Becco ammonium persulfate, followed by a warm water rinse. It is claimed to produce an unusually clean surface on the copper—free of oxides—which will not re-oxidize quickly.

E—809. WORK GLOVES—A new, improved cuffing material for work gloves, claimed to be more washable and dry cleanable, has been developed by the Glove Division of the Riegel Textile Corporation, and is now being used on all cuffed work gloves. Riegel states that this new material will withstand up to five industrial cleanings usually given to work gloves, without affecting the characteristics of the cuffing.

E—810. TOTE BOX—Just developed by Patti Plastics is a linear polyethylene tote box which measures –I.D.) 26-¾ by 25 by 12 in. deep and that stacks at 11 in. This box, which weighs less than 10 lb and will hold over 300 lb, and is chemically resistant to acids, alkalis, oils, etc.

Linear polyethylene is ideal for degreasing and washing operations and maintains its characteristics at temperatures below zero and up to 250F.

E—811. GUM BRIGHTENERS—A vegetable gum in dry powdered form derived from okra has recently become available in semi-commercial quantities. Added in small quantities to the electroplating bath, okra gum is effective in providing a brightening action on nickel plate. It may also be used in plating silver, copper and cadmium. Brightening is claimed to be increased sometimes to the extent that no further buffing or polishing is needed. Morningstar-Paisley, Inc. has been named exclusive distributor of okra gum.

E—812. Finishing Machine—A new bench model vibratory finishing machine has been announced by Almco, Queen Products Division, King-Seeley Corp. The new model—No. VT-70—is especially for precision finishing of instruments, gears, missile components, electrical parts and other extremely small metal units that require precise uniform finishing.

The portable model is 14 in. long, 11½ in. wide and 13¾ in. high. The tub has a capacity of ¾ gal and can be removed from the top of the housing of the vibratory mechanism. The fixed vibration frequency is 3300 which is designed to permit fast finishing action while maintaining high finishing standards.

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1—5000/2500 AMPERE, 12/24 VOLT, **CHANDEYSSON**, Synch

1—5000/2500 AMP., 9/18 V., 40° C., **CHANDEYSSON**, Synch. Exciter-in-head.

1—5000/2500 AMPERE, 6/12 VOLT, 25°C. **CHANDEYSSON**, Synch.

1—4000/2000 AMPERE, 6/12 VOLT, **H-VW-M**, Synch., Exc.-in-head.

1—3000/1500 AMPERE, 12/24 VOLT, **CHANDEYSSON**, Exciter-in-head.

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3—**H-VW-M** Selenium 3000 Amp., 6 V. S.C.F.C. 440/3/60.

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2—**RAPID**—1500 Amp. Periodic reverse.

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1—R100 **RONCI** Enameler.

3—**LASALCO** Ball Burnishers, No. 1, 2 & 4, Lined or Unlined.

10—Buffing Lathes—**HAMMOND, DIVINE, U. S.**, etc., from 3 H.P. to 20 H.P. Single & variable speed.

2—**INDUSTRIAL** RDR-1 & 2 Rubber Lined Filters, Sizes 10x28, 14x36.

2—**INDUSTRIAL** Type SC Filters for Cyanide. 18x48 and 18x36.

3—**PRODUCTION** No. .101 pipe polishers-Individual or in tandem

1—**HAMMOND** pipe polisher.

4—**STEVEN BADER** Belt Polishers

3—**AMERICAN** Blower type HS fans. Size 330-10.

8—**DUSKOP** Dust Collector Cabinets. Sizes No. 550, No. 850.

1—NEW Model B **NIEHAUS** S. S. fume separator.

1—**H-VW-M Munning-** Type (Mechanical lift), Full Automatic, Plating Machine 70' long x 4' wide x 36" deep x 10½' overall height.

2—**CROWN** 48 x 36, 2 compartment horizontal tumbling barrel lined or unlined.

6—**MERCIL** Nickel plating barrels 12" x 36" with R. L. tanks.

4—**DANIELS**—30LS plating bbls.

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E—813. PHOSPHATE COATING—Detrex 910 is said to be a new approach to iron phosphate coating. While it chemically cleans and phosphate coats in one operation it is claimed to be so compounded that it is able to accept up to 15 times more alkali than other products. Despite this high hardwater tolerance, Detrex 910 still remains in the proper *p*H coating range to produce superior iron phosphate coating, thus, it can be used in practically all areas within the United States without requiring any special *p*H control.

E—814. PLASMA SPRAY COATING—A new plasma spray coating and fabrication process which can deposit nearly any material on metals, ceramics, and certain plastics is now industrially available from Harper-Leader, Inc.

Applied to the basis material by the plasma jet process, the refractory metals and their compounds, oxides, nitrides, borides, and the precious metals and their alloys form a firm chemical and mechanical bonded coating. The number of combinations of compositions and physical properties of coatings applied with the process is said to be almost infinite.

E—815. FINISHING SERVICE—Minnesota Mining and Manufacturing Co. has announced a program whereby a company can apply 3M's background to solve its own particular grinding and finishing problems.

Called "Cost Check 5-5-5," the program is based on 3M's belief that coated abrasives can perform 98 per cent of any firm's grinding and finishing needs—faster, better and at lower cost.

The program is uncluttered with commercial overtones. Companies wishing to utilize the service need not be 3M customers, nor is the purchase of 3M products a requirement. The program is entirely voluntary on the part of the participating firms.

E—816. *p*H METER AND STRIP CHART RECORDER—This instrument utilizes an electronically modulated amplifier that compensates for line voltage fluctuations and uses standard radio tubes. A strip chart recorder forms the front panel of the instrument and contains a 63-ft roll of chart paper that will last for 31 days at 1 in./hr. Other chart speeds are available up to 16 in./hr by a simple gear change. A pressure sensitive coating is used on the chart paper so that annoying ink and clogged pen problems are eliminated. The Analytical Measurements Inc. *p*H Probe Unit provides a unitary glass completely protected electrode system by polyethylene which makes possible *p*H monitoring that heretofore has been impractical because of complicated installation or excessive instrument costs.

E—817. NICKEL ANODE—A new "T" bone design shaped anode (Fig. 1), whereby sludging is said to be reduced and the surfaces of the corroding anode and the deposited cathode in either a nickel sulfate/nickel chloride solution or in an all chloride bath has been developed and announced by Univertical Corporation, The development involves the use of a nickel anode of "T" bone design composed essentially of pure nickel and the elements of cobalt, copper, iron, sulfur, carbon, aluminum, chromium, lead, magnesium, manganese, silicon, gold, tin and titanium, commonly present as impurities in commercially refined nickel but additional amounts of a few thousands of a per cent of boron and zinc to that normally present as an impurity to bring the total quantity of boron and zinc to an upper limit of about 0.01 per cent combined.

Commercial tests establish that, in a violent air-agitated solution, nickel anodes of the composition described when em-

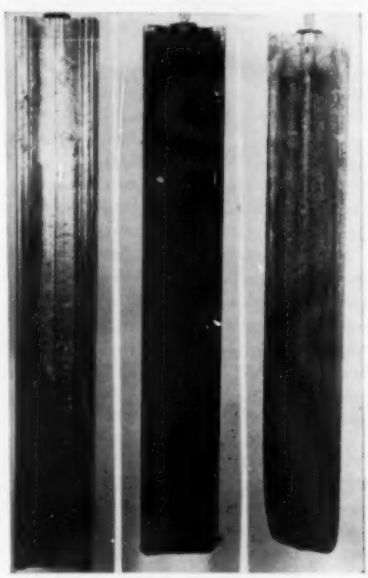


Fig. 1 Fig. 2 Fig. 3

ployed in the usual electroplating and other electrolytic operations, in a short time scientifically acquire a dense dark brownish film (Fig. 2), which adheres tenaciously to the surface of the anode. This restricts the carbon, silicon and residual insoluble impurities from migrating into the solution, and its surface remains smooth throughout its useful life. Also undissolved nickel is minimized and the formation of smooth cathode deposit is promoted. As erosion of "T" bone anode proceeds, its surface remains smooth and free from pits, worm holes and other surface irregularities. The necessity of placing a bag around the "T" bone design nickel anode is eliminated.

The "T" bone design being concave at its center and convex or bulbous at its edges offers more additional anode area

more evenly distributed in the sections where the heaviest erosion takes place, namely at the corners, without material increase in weight. In experimental commercial test runs employing the method of this development using nickel anodes of "T" bone design in a conventional violent air agitated acid electrolyte, whereby a dense adherent dark brown film quickly forms, the "T" bone erodes into a thin flat spade-like section (Fig. 3), maintaining more anode area at all times than anodes that corrode into a spear. Therefore, according to Charles T. Walter, Univertical president, the "T" bone design lends itself to more eveness of erosion with the elimination of spearing as normally found in a nickel anode of oval shape.

E—818. RINSE WATER ADDITIVE—Entek CU-56, a rinse water additive which inhibits corrosion of copper and brass, has been introduced by Enthone, Inc., subsidiary of American Smelting and Refining Co. The product produces an invisible film which prevents tarnishing, staining, spotting-out, green salt formation, pit corrosion and finger marking of copper and its alloys. It is designed to preserve freshly plated or cleaned metal surfaces during storage.

Entek CU-56 is a neutral liquid which is used at a concentration of one gallon to every 99 gallons of water. The solution should be used as a final stagnant rinse following copper or brass plating or following cleaning of copper and brass sheet, strip or tubing. A brief immersion of 5 to 30 seconds is sufficient to provide protection against 200 hours of tropical humidity conditions. One gallon of the made-up CU-56 rinse will treat approximately 500 sq ft of metal surface. It does not contain chromates and does not present any waste disposal problem.

The CU-56 coating is said to improve the solderability of copper and brass by reducing tarnishing during the warm-up period prior to flow of the solder. It also improves the adhesion of lacquers and enamels.

E—819. CLEAR PLATING STOP-OFF—Fidelity Chemical Products Corp. announces the addition of a crystal clear plastic coating, No. 637, to its line of protective Hot-Melt Dip-Pak coatings.

The No. 637 is a crystal clear plastic that is said to leave no film of any type on metal when stripped away. It is suggested for use primarily as a stop-off during electroplating or painting operations. Since Dip-Pak No. 637 exudes no oil when left standing at room temperature, it is as a semi-permanent coating or a temporary protective coating to protect metals against corrosion.

Dip-Pak materials are shipped as solid plastic blocks and melted in an electric or oil jacketed pot just before application. The part is then dipped into the molten plastic, withdrawn, and allowed to cool. The entire operation takes only seconds and the metal object is completely coated. After shipment, storage, or processing, the coating may be easily removed by slitting with a sharp blade and peeling. Peeled Dip-Pak is reusable.

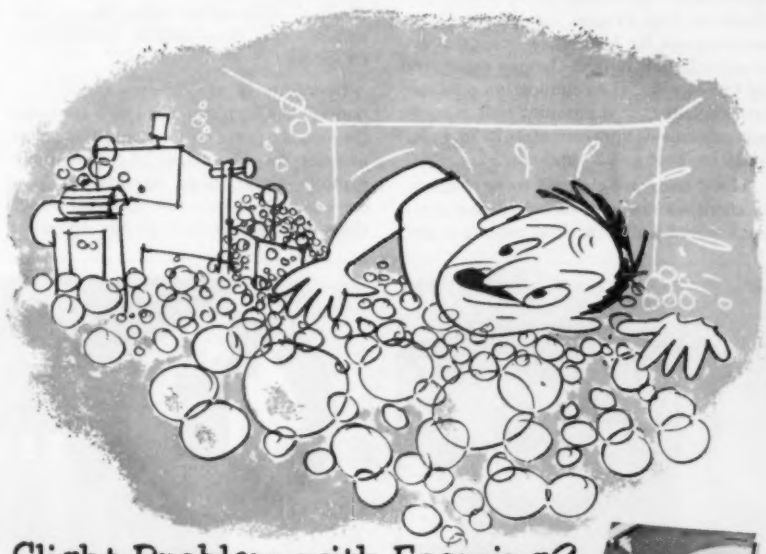
E—820. ULTRASONIC CLEANER—A self-adjusting ultrasonic cleaning system has been developed by The Narda Ultrasonics Corp.

The new unit, called the SonBlaster Automatic, is now available in a five-gallon size and will soon be available in all sizes of the SonBlaster line.

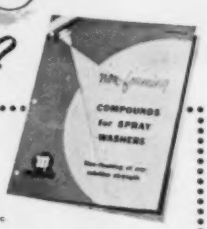
Adjustment of the new equipment is claimed to be completely unnecessary. Conventional ultrasonic equipment has always required manual adjustment during operation to compensate for variations of liquid level, operating temperature, and changes in work load. Compensation for all such variations is automatic in the new unit.

E—821. RACK COATING—Rack-Guard, developed by the Anderson's Plastics Co., Inc., is said to be a long lasting and efficient rack coating that dries fast without heat treatment. It is also used as a touch up or top coat for vinyl plastisol coatings and as a stop-off for plating solutions. Because the coating was developed to be resistant to solvents, Rack-Guard A.D. does not build as fast as vinyl plastisols when applied to rack. However, successive coats can be applied without lifting. It can be also applied over most plastisol formulations.

E—822. PICKLE FOR ALUMINUM CASTINGS—Conversion Chemical Corp. has introduced a new non-fuming pickle for aluminum castings known as Kenvert No. 45. The manufacturer claims that



Slight Problem with Foaming?



You'll find your answer in this new trio of *non-foaming spray washing compounds* — designed to out-perform any other cleaners on the market, yet guaranteed non-foaming at *any* solution strength.

Featuring a radically different *non-foaming* surfactant, these new Magnus compounds eliminate all restrictions on solution strength, simplify "make-ups" and insure both *unmatched cleaning and free-rinsing.*

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for Aluminum and Light Duty Cleaning.
MAGNUS 92X3
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MAGNUS 94X3
for Heavy Duty Cleaning of Steel.

magnus
CHEMICAL COMPANY INC
41 South Avenue, Garwood, N. J.

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☐ Please have service representative call to survey our cleaning problems.

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COMPANY_____
ADDRESS_____
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EQUIPMENT • CHEMICALS • METHODS

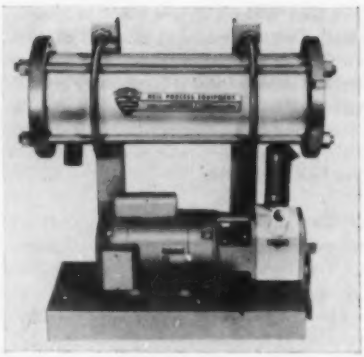
this product can produce a much whiter casting than heretofore available, and that it can treat either machine or sand cast aluminum.

Kenvert No. 45 is a powder added to 42° nitric acid to form a stable operating solution. When in use the solution does not heat up; nor does it give off brown nitrogen oxide fumes. Long immersion times produce snow white castings, as compared to the conventional nitric-hydrofluoric pickle, where the casting turns grey if left in overly long, the solution gets hot, and copious nitrogen oxide fumes are evolved.

It can be used after an alkali etch to whiten and selectively remove free silica on the surface of castings prior to anodizing, ball burnishing, chromate conversion coatings, and plating operations.

E—823. HEAT EXCHANGER—The new Series 1231 heat exchanger units complete with recirculating pump just introduced by Heil Process Equipment Corp. are designed for heating or cooling acids or other liquids in tanks having capacities up to 900 gal. The combination package heat exchanger and pumping unit is compact, measuring approximately 28 in. long, by 10 in. wide and 20 in. high.

These units are claimed to have given excellent service with nickel plating solutions where low filter flow rates are desirable and, due to the chemical inertness of Heil Nocordal impervious graphite construction, can be used with practically any acid solution.



E—824. COPPER CYANIDE PLATING PROCESS—A bright copper high speed cyanide plating process which is said to eliminate three major copper plating problems has been developed by The Harshaw Chemical Co.

Operation of the process called "Cynorex," has been simplified to a minimum through the use of only one addition agent, utilizing the advantages of current interruption—about nine seconds on, two seconds off—to provide optimum conditions for a fine-grained ductile deposit of maximum brightness. The problem of balancing two or more brighteners is eliminated.

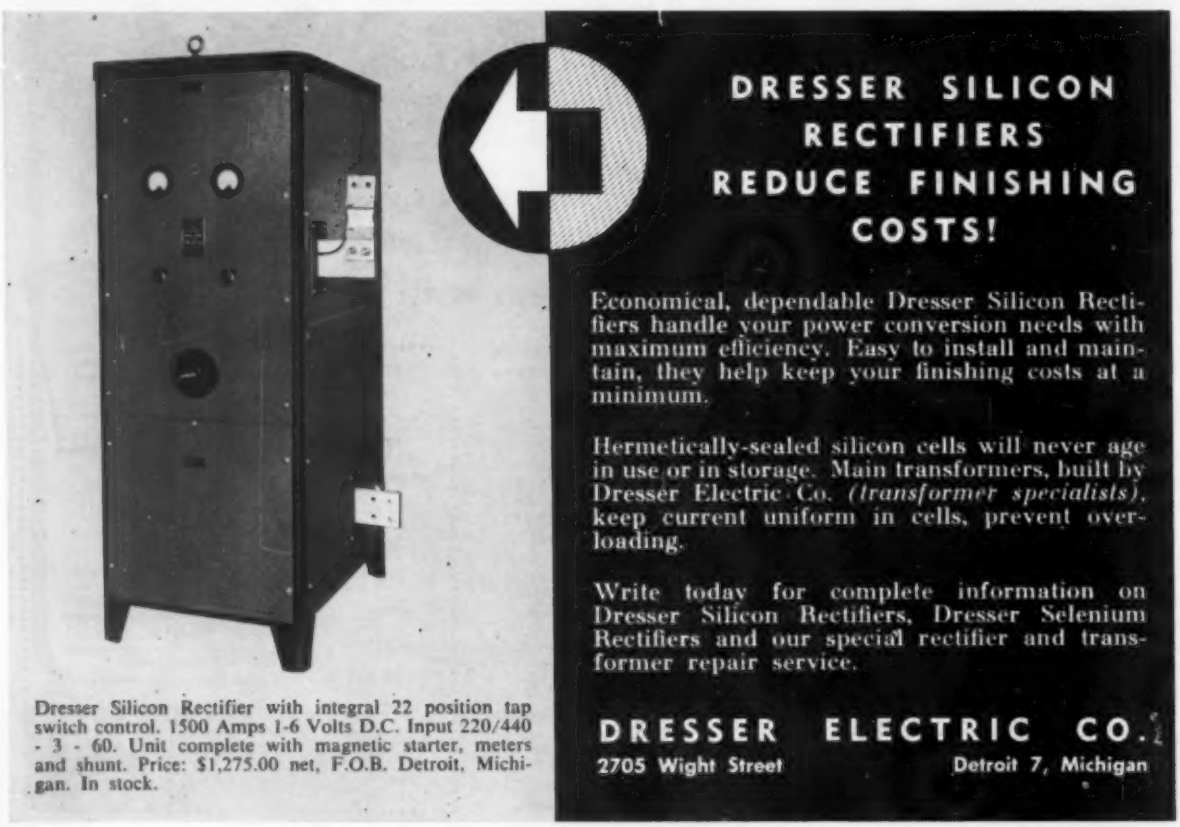
Chromium contamination has always been a source of trouble in cyanide copper plating. This problem has now been eliminated. Cynorex purifies itself. The one-addition-agent bath is not complicated with chelating or complexing agents which hold the chromium contaminant in solution. During electrolysis, the brightener accelerates the reduction of harmful hexavalent chromium to insoluble chromic hydrate, which is then easily and continuously removed by circulating the solution through a filter.

Since the Cynorex addition agent is nonmetallic and not removed by activated carbon, continuous circulation through carbon without loss of the brightener is possible.

The process will operate over a wide temperature range, but in order to minimize cyanide decomposition and carbonate build-up, an operating temperature of about 155F will give excellent deposits.

The Cynorex process will operate satisfactorily with either cathode rod movement or air agitation. When using air agitation maximum plating speeds can be obtained.

The combination of current interruption, proper bath composition and the new brightener, permits improved operation without the use of Rochelle Salts.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Economical, dependable Dresser Silicon Rectifiers handle your power conversion needs with maximum efficiency. Easy to install and maintain, they help keep your finishing costs at a minimum.
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Dresser Silicon Rectifier with integral 22 position tap switch control. 1500 Amps 1-6 Volts D.C. Input 220/440 - 3 - 60. Unit complete with magnetic starter, meters and shunt. Price: $1,275.00 net, F.O.B. Detroit, Michigan. In stock.

TRADE LITERATURE

L—801. ANODIZED ALUMINUM THICKNESS TESTER—A catalog sheet illustrates in colors the Anotron, announced by the J-R Engineering Co. as the first truly low-cost portable precision-built electronic instrument for checking the thickness of anodized aluminum surfaces. Complete description of its operation emphasizing all features are included.

L—802. ULTRASONIC CLEANING—Actual case history reports describing 12 standardized ultrasonic cleaning applications now in everyday industrial use are being offered by Acoustica Associates, Inc. The case histories contain certified data from companies actually using Acoustica ultrasonic cleaners in the manufacture or maintenance of many items.

L—803. PRECISION FINISHING EQUIPMENT—Concise, complete coverage of Lorco and Techline precision finishing equipment, supplies, and accessories is provided in Bulletin No. 1002, a six-page bulletin just issued by Lord Chemical Corp.

Photographs and explanatory text cover Lorco vibratory finishing equipment, Techline barrel finishing equipment, Liquamatte wet blast equipment, media, compounds and abrasives, and auxiliary finishing equipment, such as media pans, storage bins, magnetic and mechanical separators, dip and rinse tanks, and degreasers.

L—804. ELECTROPLATING FILTERS—Technical data on eight standard side cleaning models of Udylite's U/D Series "60" filters are offered in this descriptive brochure. High area-low pressure, portable filters for the plating industry remove contamination from nickel, copper, cadmium and zinc plating solutions. Easy maintenance and cleaning is aided through side opening operation. Capacities range from 200 to 10,000 gal/hr. The well-illustrated brochure also contains a specification table on all models. Copies are available from the Udylite Corp.

L—805. ABRASIVE FINISHING—New data sheet, number 8 of a series, on abrasive finishing methods and materials for copper plate has been issued by The Lea Manufacturing Co. Material covered includes such data as buff speeds, type of buff, proper liquid or bar abrasive compound and working hints. Types of finish discussed include color, high color, satin and butler.

L—806. POLISHING POWDER—Conversion Chemical Corp. has issued a fact sheet about its new powder for chemical polishing and deburring of zinc die castings known as Kenvert No. 55. This powder, combined with nitric acid and water, forms a solution for chemically polishing and bright dipping zinc die castings.

NEW KOCOUR TEST SETS

To solve your plating problems

Model E-24 for NICKEL baths—determines metallic nickel (E.D.T.A. method), chlorides and boric acid.

Model AT for ACID TIN baths—determines stannous tin.

Model FT for TIN FLUOBORATE and LEAD-TIN FLUOBORATE baths—determines stannous and total tin.

Model T-6 for TIN-ZINC baths—determines tin metal, and total cyanide.

Model TY-6 for TIN-ZINC baths—determines tin metal, zinc metal, and total cyanide.

PLATING WASTE EFFLUENTS

Model WCN detects as little as 1 ppm cyanides.
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Model WCU detects as little as 1 ppm copper.

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perhaps one of our **DATA SHEETS** *can suggest a solution*

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And . . . for complete spray nozzle information, write for Catalog 24.

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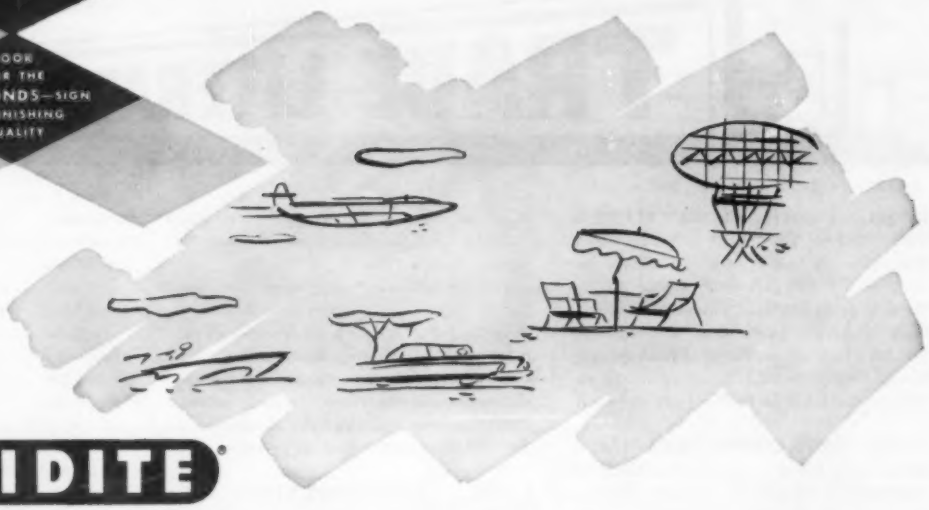

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Give you 5 additional benefits for Corrosion Protection—Paint Base—Decorative Finishing

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Developed for specific applications, there is an Iridite to provide the finish you desire, fit the equipment you have available and give the performance you require. Most Iridite coatings meet rigid military and civilian specifications.

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Our large field engineering staff is thoroughly familiar with chromate conversion coatings and related finishing operations. They'll help you check every step in your finishing operation to make sure you're getting the best possible finish on your products.

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4 ECONOMY

The superior performance of Iridite provides low final cost by extending operating life and lowering maintenance costs. In addition, Iridite gives you a finish that adds considerably to the value of your product. There's an Iridite to meet every cost and performance requirement.

5 RESEARCH AND DEVELOPMENT FACILITIES

If you have an unusual application, we will gladly work with you. Our entire staff of experienced engineers and chemists, and our completely equipped facilities are at your service.

IRIDITE—a specialized line of chromate conversion coatings for non-ferrous metals. Apply by dip, brush or spray methods — at room temperature — manually or with automatic equipment. Forms a thin film which becomes an integral part of the metal. Cannot chip, flake or peel. No special equipment, exhaust systems or specially trained personnel required.

If you are using chromate conversion coatings to finish zinc, cadmium, aluminum, magnesium, silver, copper, brass or bronze — consider the above benefits of Iridite. For complete information, contact your Allied Field Engineer. He's listed under "Plating Supplies" in the yellow pages. Or, write for FREE TECHNICAL DATA FILE.

Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND

BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN

West Coast Licensee for Process Chemicals: L. H. Butcher Co. • European Agent: Stora Gronberger, Stergatan 10, Stockholm, Sweden

Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment

The No. 55 solution may be used before plating to brighten the subsequent plate. It may be used to improve the appearance and corrosion protection of die castings used without further finish. It may also be used to restore the finish to castings that have been spoiled through paint or plate stripping, corrosion in process of manufacturing. It is claimed to produce an excellent finish for adhesion to paint or lacquer.

The new powder is effective for deburring zinc die castings if stock removal requirements are small. It is packaged in 100 lb and 400 lb polyethylene lined steel or fiber drums.

L—807. SOAK CLEANERS—Frederick Gumm Chemical Co. offers a technical bulletin, No. 360, which describes a number of their Clepo soak cleaners.

The eight cleaners discussed, both granular dustless compounds and liquid cleaners, represent general fields of use and indicate the range of the line. Included are applications and features of the specific cleaners, recommended cleaning time and temperature at which each is used.

L—808. WATER AND WASTE TREATMENT—Methods and equipment for treating metal finishing process water and wastes are covered in technical reprint T-180, available from Graver Water Conditioning Co.

Entitled "Water and Waste Treatment," the 12-page article is a complete review of the subject. It discusses reasons for treatment; how to investigate the problem; modern treatment methods available for hexavalent chromium, cyanides, acids and alkalies, oily wastes and process water.

L—809. COATINGS SELECTOR—Released by Bee Chemical Co., Logo Division, is a guide to the selection of specialty coatings available for application on plastics, metals, glass and wood. The charts, which can be mounted for ready reference, show the uses and characteristics of the company's spray, dip and flow coating materials, vacuum metalizing coatings and standard plastisol formulations.

L—810. TAPES AND ADHESIVES—Permacel, manufacturer of pressure-sensitive tapes and adhesives, has compiled a comprehensive product applications directory entitled, "Where to Use Permacel Products".

The 121-page, pocket size booklet has listings for every major type of industry and business in the country, showing which products are used for specific applications in each industry. The recommended products include pressure-sensitive tapes, adhesives, sealants, coatings and electrical insulating materials.

LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY

double corrosion protection

on Aluminum, Magnesium and Zinc-plated parts

with

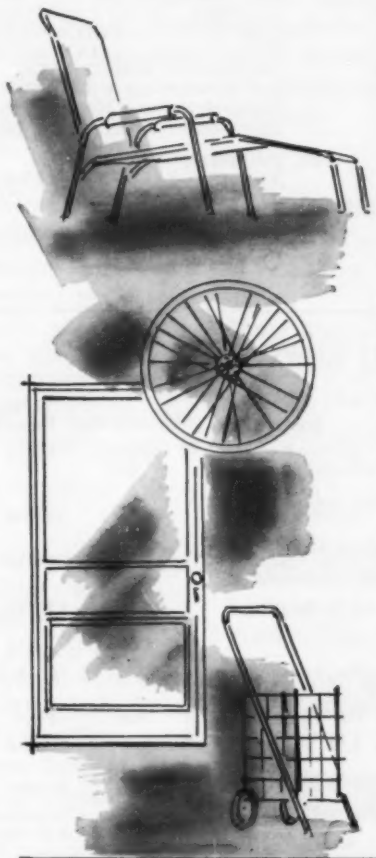
IRIDITE®

CHROMATE CONVERSION COATINGS

and

IRILAC®

CLEAR PROTECTIVE COATINGS



Here's a fast, easy way to practically double corrosion protection on your products. Simply follow the Iridite process with an application of Irilac. You give parts extra protection from corrosive conditions, added abrasion resistance, longer shelf or storage life, protection from finger marking and increased beauty for a more attractive appearance and faster sales.

ON ALUMINUM—An Iridite-Irilac finish provides long life under many service conditions. Iridite colors range from natural aluminum to golden yellow. Additional dyes give other color ranges.

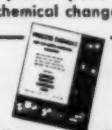
ON MAGNESIUM—Irilac over Iridite 15 increases protection, resists damage from handling or abrasion. Color range—light to dark brown.

ON ZINC—Iridite plus Irilac gives longer product life, brighter appearance. Color range—clear Iridite to olive drab, plus colored dyes.

IRIDITE—chromate conversion coatings for non-ferrous metals applied by dip, brush or spray, at room temperatures manually or with automatic equipment. Provides corrosion resistance, a base for paint or decorative appearance. Forms a thin film integral with the metal. Cannot chip, flake or peel. No special equipment, exhaust systems or specially trained personnel required.

IRILAC—Clear protective coatings for all metals. Safe and easy to handle as water. Apply by dip or brush. No exhaust or special fire prevention equipment required. Adds protection and abrasion resistance to base metals, plated parts or parts treated with electrolytic or chemical post treatments without chemical change.

For complete technical information on IRIDITE or IRILAC coatings, write for FREE TECHNICAL MANUAL. Or, see your Allied Engineer. He's listed under "Plating Supplies" in the yellow pages.



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ARTICLE REFERENCES

By
WILLIAM TUCKER
Eastman Kodak
Rochester, N. Y.

Most of the articles listed here may be obtained by writing to the publications in which the articles were published. Addresses are given at the end of the references for the reader's convenience.

Photostat or microfilm copies of articles in available magazines may be obtained from: Library of Congress, Washington, D. C.; New York Public Library, New York; Engineering Societies' Library, New York, at prevailing rates. In other cases, consult Wilson's Union List of Serials at your nearest public library for other sources of these articles.

99. ALLOYS

BRONZE PLATING SOLVES FINISHING PROBLEMS.
F. A. Lowenheim.
Metal Progress, June 1960, *77*, No. 6, pp. 126–129.

100. CORROSION

a. *CORROSION RESISTANCE OF TANTALUM—APPLICATIONS IN THE CHEMICAL INDUSTRY.*
F. G. Cox.
Corrosion Technology, March 1960, *7*, No. 3, pp. 69–74.

b. *RELATION BETWEEN COATING THICKNESS AND PROTECTION—EFFECT OF POROSITY AND PHYSICAL AND STRUCTURAL CHANGES ON CORROSION RESISTANCE.*
L. I. Kadaner and A. Kh. Masik.
Electroplating and Metal Finishing, May 1960, *13*, No. 5, pp. 167–168.

101. ENGINEERING

NON-CONTACTING LINEAL SYSTEM PROGRAMS TIN-PLATE LINE.
The Iron Age. May 26, 1960, *185*, No. 21, pp. 104–105.

102. EXPERIMENTAL

VAPOR-DEPOSITION METHOD PRODUCES ADHERENT TUNGSTEN COATINGS.
Products Finishing, June 1960, pp. 90–96.

103. FINISHING

a. *IMPROVED BUFFING TECHNIQUES. PART II.*
James A. Badaluco, W. L. Morgan, Paul A. Waalkes, and Ezra A. Blount (Round-table discussion).
Products Finishing, June 1960, pp. 58–66.

b. *PROGRESS IN LIQUID POLISHING COMPOSITIONS.*
H. Silman.
Electroplating and Metal Finishing, May 1960, *13*, No. 5, pp. 159–163.

104. GOLD

THICKNESS AND HARDNESS MEASUREMENTS ON GOLD DEPOSITS.
Grace A. Wilson.
Metal Finishing, June 1960, *58*, No. 6, pp. 50–52.

105. MANAGEMENT

CALCULATING METAL FINISHING COSTS.
Bernard Gaida. 7th installment—Plating Management, May 1960, pp. 9–11. 8th installment—June 1960, pp. 9–11.

106. MISCELLANEOUS

a. *SCIENCE FOR ELECTROPLATERS—58. ADHESION.*
L. Serota.
Metal Finishing, June 1960, *58*, No. 6, pp. 69–70.

b. *INSTITUTE OF METAL FINISHING ANNUAL CONFERENCE, 1960.*
Electroplating and Metal Finishing, May 1960, *13*, No. 5, pp. 169–176.

107. ORGANIC

a. *PANEL DISCUSSION OF PAINTERS' PROBLEMS.*
Products Finishing, June 1960, pp. 50–56.

b. *KOCH USES HAND-HELD ELECTROSTATIC GUN TO COAT BRASS FURNITURE.*
D. F. Nuebling.
Products Finishing, June 1960, pp. 72–75.

c. *SYNTHETIC RESINS—THE BACKBONE OF MODERN FINISHES.*
Part I. General Introduction.
Harold P. Preuss.
Metal Finishing, June 1960, *58*, No. 6, pp. 46–49.

COURSES IN ELECTROPLATING

City	School	Instructor	Tuition Fee	Course Length
Vancouver, B. C.	Vancouver Technical School	Walter Kellerman	Approx. $15	6 mos.
Brooklyn, N. Y.	Fort Greene Evening High School.	Louis Serota	None	18 wks.
Chicago, Ill.	Illinois Institute of Technology	J. M. Andrus	$80	18 wks.
Cleveland	Max S. Hayes Trade School	J. P. Branciaroli	$11	15 wks.
Indianapolis*	Purdue University Extension	Dr. A. M. Max	$45	16 wks.
Montreal	Polytechnique Institute	Dr. Andre Honé	$50	3 yrs.
New Haven	New Haven College	L. J. Durney	$50	15 wks.
Newark	Various Plants and Laboratories	F. J. LaManna	$25	14 wks.
Philadelphia, Pa.	Temple University Technical Institute	Dr. S. Heiman	$37	4 Semesters Each 16 wks.
Portland, Oregon	Portland State College	Dr. J. R. Mickelsen	$15	10 wks.
Providence: Attleboro	Central Senior High School	Omer Jette J. Fogarty J. Castriotta	None	2 yrs.
South Bend, Ind.	—	Dr. H. J. Wiesner	—	—
St. Louis	Hadley Technical High School	Dr. Otto C. Klein	$10	16 wks.
San Antonio	Trinity University	W. P. Wisdom	$10	18 wks.
San Francisco	—	M. Raskin	$36	18 wks.
Toronto, Canada	Central Technical High School	R. H. Clark	$15-non-res. $ 5-city res.	22 wks.
Evansville, Ind.	Jos. B. Kushner Electroplating School, 621 S. Norman Ave. (Corresp. Course)	Jos. B. Kushner	$150	4 mos. to 1 yr.

The above listings were correct so far as could be ascertained at press time. Prospective students are urged to verify courses prior to making definite plans.

**Next course September 1961.*

Corrosion
National Association of Corrosion Engineers
1061 M & M Bldg
No 1 Main St
Houston 2, Texas

Corrosion Technology
Leonard Hill Technical Group
Stratford House
9 Eden St.
London, N.W.1
England

Electroplating and Metal Finishing
15 Udney Park Rd.
Teddington, Middlesex
England

The Iron Age
Chestnut and 56th Streets
Philadelphia 39, Pa.

Metal Finishing
381 Broadway
Westwood, N. J.

Metal Progress
American Society for Metals
7301 Euclid Avenue
Cleveland 3, Ohio

Plating Management
11 Park Street
Montclair, N. J.

Products Finishing
431 Main St.
Cincinnati, Ohio

LEA

ABRASIVE FINISHING METHODS

SILVER PLATE

In the silverware field and more recently in the electronic and missiles fields,wear-resistant plates of silver are electro-deposited on nickel silver, copper, brass, steel and other metals. The base metal is brought to a smooth finish by cut-down buffing, regardless of whether the final silver finish is to be a mirror or a butler finish. The methods of producing these finishes are the same as given in previous **Data Sheets on Abrasive Finishing for the Various Metals,** with some modifications.

HAMMERED FINISH...A hammer-finish appearance on silver plated items is accomplished by first hammer-finishing the base metal and imparting a satin or bright finish, approximating the desired final finish which the silver plate will duplicate. Subsequent buffing of the silver plate should be done with a grade of **LEA COMPOUND** or **LEAROK** as suggested for producing the various finishes listed below, particularly where the silver plate is milky white in appearance.

DULL SATIN FINISH...Base metal is first satin finished to the degree of coarseness wanted with **Grade "B"** or **Grade "L" Lea Compound** on a loose muslin buff at 5000 sfm. After plating, the plated finish can be given a final **dull finish** with one of the finer grades of **Lea Compound,** such as **"MH"** or **"B-12."** The finishing operation should be done in the same direction as the base metal coarse finish lines, so that the final finish will show no crossing of the abrading lines.

SPECIAL FINISHING
BRIGHT BUTLER RELIEVED, OXIDIZED FINISH

Sometimes, a **bright butler relieved, oxidized finish** is required which will show the dark silver sulphide in the recesses of the design. In such cases, the articles are "oxidized" immediately after the silver plating operation and the parts are then **relieved** and **butler finished** in one operation with **Lea Compound** such as **Grade "B-12,"** on a loose muslin buff at 7500 sfm.

These standard finishes are produced as a final finish on the silver plate. Prior to silver plating, the base metal must be adequately prefinished with a Learok or Liquabrade as recommended in data sheets for bright finishing of the specific metal.

DULL BUTLER FINISH...**Grade "MH" or "B-12" Lea Compound** on a full disc or packed muslin buff at 7000 to 7500 sfm.

BRIGHT BUTLER FINISH...**Grade 5023 Lea Compound** on a loose muslin buff at 7500 sfm.

SEMI-MIRROR AND MIRROR FINISHING...A **semi-mirror finish** can be produced on **Silver Plate** with **884 Learok-Bar Compound,** on a loose muslin buff at 7500 sfm. **Grade A-100 Greaseless Red Rouge** bar compound, or **Grade 90LR Liquid Rouge** will give a satisfactory mirror finish.

ULTRA-MIRROR FINISH...Proceed as with mirror finishing and follow with lamp black and kerosene in slurry form applied to a soft canton flannel buff.

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Lea Mfg. Company of Canada, Ltd., 1236 Birchmount Road, Scarborough, Ontario, Canada
Lea Mfg. Company of England, Ltd., Buxton, Derbyshire, England
Lea-Ronal, Inc., Main Office and Laboratory: 139-20 109th Ave., Jamaica 35, N. Y.
Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.

Are you interested in plating specialties? SEE THE OTHER SIDE OF THIS INSERT

Tailored Gold Plating Process

...there's a specific Lea-Ronal Gold Process to meet your own exacting requirements

Over the years Lea-Ronal has conducted considerable research and development on Gold Plating. From this research and development have come numerous processes each with its own characteristics that makes it outstanding for a specific type of operation. Every member of this Lea-Ronal family of Gold Processes has been production-tested and has been instrumental in improving the quality and production of the users' plating operation.

If you are plating gold, you should investigate these standout Gold Processes.

for pure Bright 24.00 K acid gold

AURO GLEAM 24.00

—a pure 24.00 K bright acid gold bath containing absolutely no alloying elements and representing a radical departure from all previous type bright gold processes. Will produce bright deposits directly from the bath. Solution is very stable, simple, and economical to operate. Wide bright current density ranges. Designed specifically for printed circuitry and electronic uses requiring a 100% pure bright gold deposit.

bright acid golds with microleveling

AURO GLO 4

—a bright acid type gold with freedom from porosity with microleveling. Suitable for heavy coatings up to 0.003 inches. Bath has wide plating range, is very stable, and produces hard deposits of 23.9 K. Metal distribution is superior to cyanide gold baths. Successfully used for electrical connectors, semi-conductors, and the like.

for 'Hamilton' shades with extreme hardness

AURO GLO 12

—an acid type alloy, bright gold, producing shades of a Hamilton color. Particularly adaptable for decorative finishes. Bath has wide bright plating range, produces deposits of exceptional hardness (375-400 Knoop). Simple color control.

for bright high speed gold plating

AURO GLO H. S.

—a neutral type, high speed bright gold. Deposition rates of 0.003 inches per hour can be obtained from standard bath. Can utilize the same equipment as standard cyanide golds. Simple to control. Broad bright plating and temperature range.

for hard flash coatings

HARD GOLD FLASH

—hard gold flash salts. A simple process for depositing flash coatings and plates up to 40 millionths that are bright to semi-bright. Deposits are hard of Hamilton type shade. Bath has zero free cyanide, which makes for ease of control.

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Are you interested in Buffing, Polishing and Burring Specialties? **SEE OTHER SIDE OF THIS INSERT.**

PERSONALS

EDWARD J. LYNCH has been named sales manager of the Minneapolis District of Wyandotte Chemicals' J. B. Ford Division.

Mr. Lynch began his sales career with Wyandotte in 1948, and was a field sales manager of the Division's Cincinnati District prior to his latest assignment.

E. J. Lynch

E. F. R. Quarton

EVAN F. R. QUARTON has been appointed assistant chemist on the laboratory staff of The Lea Manufacturing Co., Waterbury, Connecticut.

Mr. Quarton is a graduate of the University of Massachusetts and a member of the American Institute of Chemical Engineers.

Previous connections included duty as an aerographer in the U. S. Navy, and the position of chemical plant inspector with the Factory Insurance Association.

♦

F. C. (SI) BISSELL has been appointed by Bias Buff and Wheel Division, Riegel Textile Corp. as their representative in the Grand Rapids-Saginaw Valley area. He will report to **B. R. BOYD** in the Detroit office, 4346 N. Woodward Avenue, Royal Oak Michigan.

Mr. Bissell joins Riegel with more than 30 years' experience in the polishing and buffing field, including three years in his own business. For 25 years he was with Doehler Jarvis Division of National Lead, Grand Rapids Plant, the last 12 years as finishing superintendent.

F. C. Bissell

R. I. Peters

ROBERT I. PETERS has been named manager of the Rigidon plant of Heil Process Equipment Corp. of Cleveland, Ohio. He will be in charge of all manufacturing, estimating, and product promotion of the company's Rigidon reinforced plastic corrosion resistant process equipment.

Mr. Peters joined the company in 1946 as an estimator, later became a sales engineer, Western Division Sales Manager, and more recently was assistant chief engineer. He is a graduate of Penn College in Me-

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defies chemical attack, heat

"in tank" PUMP
and
outside FILTER
with detachable
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Model UAL-20 200-300 Gals./Hr.
other models from 50-1200 Gals./Hr.
Compact, takes little space in tank

It's corrosion proof . . . handles all acids and alkaline solutions up to 250°. Self-priming, leakproof EPOXY sump pump provides continuous duty performance. Bracketed inside the tank, it requires no floor space. Outside bracket supports High Temp. Lucite or Epoxy filter chamber . . . ½ or ¾ HP motor. Pump and filter chambers are available separately.

For complete details: WRITE for Spec. Sheet No. 751B

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Deering, Milliken

RESEARCH
AND
CONTROL

From cotton...
to yarn...
to cloth...
to buff...

RESULTS IN SUPERIOR BUFF CLOTHS

The Long and the Short of It!

Staple means length when discussing cotton fiber...and staple is a mighty important factor in making buff cloth. After having selected the areas—even the plantations—from which the cotton for Milliken is to come, an important control is in checking the staple or length of the fiber...and strangely enough in this day of modernization, this checking is best done by hand. It takes four years to train a 'classer' as he is called. But once he learns how to make this intricate test, he is astonishingly accurate. Even if the cotton fibers get his approval, there's more checking and testing...all aiming to provide the users of buffs with the best buff fabrics that can be made.

So much for another important Milliken Control Check. On the opposite page, some of the results of this painstaking control may suggest to you that you, too, should investigate the merits of buffs made of Milliken cloth. Your supplier will get them for you.

Have you read the Story of Deering, Milliken Research and its part in the development of the line of Milliken Buff Cloths? If not, let us know and we'll be glad to send you a copy. You will find it both interesting and informative.

ENGINEERED BUFF FABRICS by *Milliken*

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chanical Engineering. Mr. Peters is a member of the Cleveland Engineering Society and several other technical groups, and is a past president of the Cleveland Branch of the American Electroplaters' Society.

♦

DANIEL B. LAMB has been appointed Detroit division manager for Oakite Products, Inc. He replaces **THOMAS B. SMITH,** who is retiring after 19 years as head of the Detroit division.

Mr. Lamb joined Oakite as a technical service representative in Knoxville, Tenn., in 1947. For the past seven years he has served industry in the Kokomo, Indiana area. In 1956 he received the company's citation for distinguished service to industry.

D. B. Lamb

L. E. Welch

G. E. Park

J. D. Enstad

LON E. WELCH, formerly a representative in Akron, Ohio, of Oakite Products, Inc. has been transferred to Kokomo, Indiana where he replaces Daniel B. Lamb, recently appointed manager of the company's Detroit division. **GEORGE E. PARK,** a graduate of the University of Arkansas, has been named to the Springfield, Missouri territory, and **JAMES D. ENSTAD,** a graduate of the University of Minnesota, has been appointed representative in St. Paul, Messrs. Enstad and Park recently completed an intensive eight-week training program at Oakite's New York laboratories and in the field.

♦

ROBERT DUVA, formerly chief chemical engineer for Sel-Rex Corp., has been appointed technical director of Platronics, division of Palumbo Bros., Inc., Newark, N. J.

A chemical engineering graduate of Iona College, Mr. Duva also holds an MS degree in process engineering from Fordham University. An authority on plating of electronic components, Mr. Duva is co-inventor of several precious metal electroplating processes used widely by the electronics industry. He will have a completely equipped laboratory and skilled technicians at his disposal to implement a research and development program.

In addition to his last position with Sel-Rex, which he held for over eight years, Mr. Duva was also engaged in high temperature research with the U. S. Air Force, and was chemical engineer with Koppers Chemical Co. He is a member of the AES Newark Branch.

R. Duva

E. J. Kankowski

EUGENE J. KANKOWSKI, recently production control manager for L. L. Constantin, has been appointed sales engineer, Platronics Division, Palumbo Bros., Inc. Mr. Kankowski will utilize his wide acquaintance in the electronics industry to promote the close tolerance plating service—particularly with precious metals.

Mr. Kankowski, who attended Newark College of Engineering, also holds a BS degree in accounting from Seton Hall University.

MICHAEL BORUSHKO

The Detroit Branch mourns the passing of Michael Borushko on May 30, 1960, at the age of 49. A prominent member of the Detroit Branch since 1948, Mike Borushko was well known both locally and nationally throughout plating and metal finishing circles.

Originally with Ditzler Color Division of Pittsburgh Plate Glass Company, he next went with Harding Manufacturing Company, Detroit, where he was vice president. Later, he was with Fort Die Cast Company, Maryville, Michigan before forming Rampart Industries, Detroit, in partnership with Ray Easton.

Several major plating and metal finishing processes were developed and perfected by Mike Borushko. Notable among them are Plating on Aluminum by the Zincate process, Hot Dip Paint application, and Tack Cloth, an important accessory in the paint industry.

Mike Borushko will be missed in the industry and the AES where he was well liked and always prominently active in all affairs of the Detroit Branch.

Guy A. Cummings Jr.,
Sec.-Treas.
Detroit Branch, AES

BOOKS

(*Continued from page 958*)

oxalic acid baths, racking, sealing, inspection, etc. In a chapter on applications are discussions of anodic coatings on aluminum for oxidation protection, as electrical insulation and for decorative applications (under which dyeing techniques are described). Also described are various applications for wear resistance, one of the more novel being anodic coatings on aluminum printing plates. The techniques for making photographs on anodized aluminum plates impregnated with silver salts are described in some detail, and the authors indicate that the process is used for making maps, instrument scales, name plates, etc.

The fourth chapter on anodizing, and the last in the book, is a brief description of anodizing of magnesium, copper, zinc, cadmium, silver, and steel.

One can find fault with some aspects of the book. Its organization could be improved in several instances. For example, data on the degree of smoothing as a function of operating parameters are scattered between chapters 3 and 7. The section on anodizing of aluminum is not as complete and thorough as is that in a currently available British book. On the other hand, the presentation of electropolishing is more complete than is elsewhere available in a single source. The book is recommended to anyone concerned with the subjects covered, especially to those concerned with electropolishing.

The bibliography of 141 references includes mainly Russian publications. The covers and binding are not of a quality one might expect in a book of its cost, but the paper and typography are good.

VERNON A. LAMB
National Bureau of Standards
Washington 25, D. C.

PLATING MAGAZINE

OPPORTUNITY TO AUTHORS

Member or non-member authors of technical and scientific papers on electroplating, metal finishing and allied arts are cordially invited to submit manuscripts of original, unpublished papers to the Editor of PLATING MAGAZINE for review and publishing consideration.

Any such paper accepted and published in PLATING will also be eligible for selection by the Society's Paper Awards Committee for the Carl E. Heussner AES Gold Medal Award; AES Silver Medal; AES Bronze Medal; George B. Hogaboom Memorial Nickel Plating Award; Robert S. Leather Mechanical Finishing Award; Chromium Plating Award; Precious Metal Plating Award of AES, or the John J. Hanney Memorial Copper Plating Award.

So as to expedite review and other processing, please write the Editor, PLATING MAGAZINE, 443–445 Broad Street, Newark 2, New Jersey, for full particulars, including a copy of "Publishing Specifications for PLATING MAGAZINE Authors", before submitting your manuscript.

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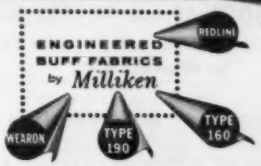
As a result of extensive tests, the above company reports that WEARON did a much better job...so much better, as a matter of fact, that the company changed its specifications to WEARON for all its buffs on this class of work.

Practically every test made in the field on a great many articles indicates that WEARON is clearly a superior cloth for buffs for certain finishing requirements...a superiority that can be measured in dollars and cents savings. Cloth X will turn out so many pieces per buff —WEARON will turn out X + Y pieces. The value Y in terms of production is proving to be more than the small additional cost of WEARON. If you are concerned with your buffing costs, why not put a WEARON buff to work...on a strong competitive basis. If the unknown Y also exceeds the small cost differential, wouldn't it be smart to change to WEARON?

This 12-page brochure tells about our extensive research, testing and control facilities starting with the cotton fiber through to the finished cloth. Would you like a copy?



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INDICATE A 844.

PATENT ABSTRACTS

(*Continued from page 957*)

2,916,401, 12/8/59—ELECTROLESS NICKEL PLATING—L. Puls and W. Vincent, assignors to General Motors Corp., Detroit, Mich.

An electroless nickel bath of *p*H 7 to 11 is described as containing:

$Nickel^{++}$	0.005–0.2 mole/liter
Hypophosphite ion	0.01–0.4 mole/liter
F^-	0.2–1.0 mole/liter
Alkyl or alkanol amine	N/Ni^{++} ratio of 1:1 to 10:1
Carboxylic acid or salt	$COOH : PO_2^-$ of 1:1 to 10:1

13 claims.

2,916,424, 12/8/59—CHROMIUM PLATING—J. Stareck et al, assignor to Metal & Thermit Corp., Woodbridge, N. J.

Claim 1 states: "A process for electrodepositing bright crack-free chromium to a thickness of at least 0.00005 inch on a metal cathode comprising passing current from an anode to said cathode immersed in an aqueous chromium plating bath at a temperature between 112 and 140F, said bath containing less than 0.05 g/l of chloride ion and comprising essentially between 180 g/l and 540 g/l of CrO_3, a total catalyst ion concentration of between 1.2 g/l and 6.3 g/l of sulfate and silico-fluoride ions, the Ratio of CrO_3 concentration to total catalyst ion concentration being between 80:1 and 150:1, the sulfate ion content being between 20 and 85 per cent of the total catalyst concentration, the CrO_3 concentration, Ratio and temperature having a relationship defined by the areas enclosed by the curves in Fig. 1.

6 claims.

2,916,431, 12/8/59—ELECTROPLATING RACK—S. O'Connor, assignor to Western Electric Co., Inc., New York, N. Y.

A plating rack is described.

2 claims, figure.

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TRUE BRITE Nickel Brightener

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the easy way to control of color and performance of brass plating.

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Over 30 ranges to suit all possible solutions and conditions.

SODIUM and POTASSIUM Copper Cyanides

Highest quality soluble salts from our own production for all solutions.

Bulletins available on all products

TRUE BRITE CHEMICAL PRODUCTS CO.

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2,916,806, 12/15/59—PLATING METHOD—J. Pudvin, assignor to Bell Telephone Laboratories, New York, N. Y.

Method of plating n-type semiconductors consists first of gold plating, then antimony plating followed by heat treating.

5 claims, figure.

2,917,419, 12/15/59—ADHERENT OXIDE FILM—P. Robinson, assignor to Sprague Electric Co., North Adams, Mass.

Anodized niobium or tantalum foil is treated with hydrogen to expand crystals. The hydrogen is removed and oxygen is then introduced to form solid solution of oxygen embedded within the interstices of the expanded lattice.

3 claims.

2,917,438, 12/15/59—ELECTRICAL COMPONENT—A. Wiley, assignor to Sylvania Electric Products, Inc., Wilmington, Del.

An electroforming method for forming a metal helix is described.

3 claims, figure.

2,917,439, 12/15/59—METALLIZING NON-CONDUCTIVE MATERIAL—H. Liu, Bayside, L. I., N. Y.

Coat an article with a thermosetting adhesive which cures in stages (polyamide epoxy or phenol urea-formaldehyde and melamine formaldehyde resins). Cure to the "B" stage, then deposit a porous metal layer after which a full cure of the resin is effected.

7 claims.

2,917,440, 12/15/59—TITANIUM METAL PRODUCTION—C. Olson, assignor to E. I. DuPont de Nemours & Co., Wilmington, Del.

A fused salt electrolysis method for preparing pure titanium from an impure alloy is described.

15 claims.

2,917,818, 12/22/59—ALUMINUM COATED STEEL—R. Thompson, assignor to The General Motors Corp., Detroit, Mich.

A ductile, oxidation resistant coating on a ferrous metal article is claimed to be formed by coating first with chromium (0.00025–0.001 in.), then the article is immersed in a fused salt bath at 1280–1400F, after which it is hot-dip aluminum coated.

4 claims.

2,918,357, 12/22/59—ALUMINUM ETCHING—R. Elliott, assignor to Pennsalt Chemicals Corp., Pennsylvania.

The rate of etch of magnesium-rich aluminum alloys can be increased by adding stannous tin to the alkaline etching solution.

10 claims.

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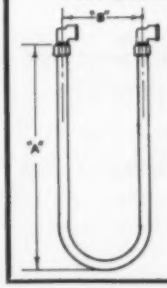

Coil No.	Eff. Heating Area Sq. Ft.	"A" In.	"B" In.	Price
Ti-30	.8	30	12	50.00
Ti-36	1.0	36	12	57.00
Ti-42	1.2	42	12	64.00
Ti-48	1.4	48	12	71.00
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BRANCH NEWS

Total AES Branches U. S., Canada, Australia, August 1, 1960—58.

BLUE RIDGE

Family Picnic at VPI

The members of the Blue Ridge Branch attending the June 4 meeting enjoyed a picnic on the campus of Virginia Polytechnic Institute in Blacksburg, Virginia. Forty-one members, their families and guests were present. Everyone had a very enjoyable afternoon.

Dr. Nelson Murphy, research professor at the school, had tours arranged for both men and women. The women were taken on a tour of the home economics department of the school. The men toured the physics department and saw the recently completed atomic reactor. After the tours everyone enjoyed a southern style barbecued chicken picnic.

The monthly meetings of the Branch have been recessed until September.

Donald H. McGee
Secretary

BRIDGEPORT

Levy Discusses Magnesium Plating; Barrett Supported for National Office

The regularly scheduled business meeting and educational session of the Bridgeport Branch was held in the main ballroom of the Hotel Barnum on Friday, May 13. Forty-two members and guests were present.

President **Al Ferguson** called the meeting to order.

Raymond O'Connor, honorary member of the Branch, inducted the newly elected officers. He congratulated them and charged them with their duties as they were installed. They are: **William Hyatt Jr.,** president; **William Lindsay,** first vice president; **J. Haas,** second vice president; **Robert Parker,** secretary-treasurer; **E. Bergen,** librarian; **Edmond Owen,** sergeant-at-arms; **V. Consalvo, R. Barrett, H. Goldman** and Al Ferguson, board of managers.

Mr. Ferguson turned over the president's gavel to Mr. Hyatt who, in turn, presented Al with a past president's pin.

President Hyatt appointed the following committees: Publicity, Ed Owen; Projector, **J. Carnicky.**

Special committee chairmen are: Christmas Dinner Dance, **Carl Sievert;** Olde-Timers' Nite co-chairmen, R. Barrett, A. Ferguson; New England Regional Committee—All officers of the Branch.

A new active member was presented with membership pin and certificate.

Joseph Haas, after a well planned resume of the merits and qualifications of the man he was discussing, presented Richard C. Barrett as a candidate for the third vice presidency of the Supreme Society. It was seconded by **Phil Bailin.** A motion was made, seconded and passed, that the national delegates be instructed to support Mr. Barrett completely.

Joshua P. Levy of the American Electroplating Co. of Cambridge, Mass. was introduced by **E. Bergen.** Mr. Levy discussed plating on magnesium as practiced by his company using techniques recommended by process developers, as well as accumulated know-how acquired by experience. His talk was well received and, after a lively question and answer period, he was tendered a rising vote of thanks for his presentation.

Herman Braun won the door prize.

CHICAGO

Carmichael Explains Ultrasonics Applied to Electroplating

The members of the Chicago Branch met, for the last session of the 1959–60 season, on Friday, June 10, at Petricca's Restaurant and Lounge, 510 North Western Avenue. This site was selected on a trial basis for future meetings of the Chicago Branch. **Charles Geldzahler** received a "pin" from the Branch for serving as president of the Branch during the 1959–60 term. **Paul Glab** made the presentation of the "pin." Ten applications were turned over to the board of managers for approval.

Mr. Glab announced that plans are underway for the next Midwest Regional Session which is to be held on October 29, 1960, at the University of Notre Dame, South Bend, Indiana. **Si Gary,** librarian, informed the members that he met with his committee, the committee consists of eight members and decided to have three round-table discussions for the coming year. Meetings will be held on the second Friday of the month, the meeting place to be decided by the board of managers.

Si Gary introduced **John Carmichael,** of Branson Ultrasonic Corp., whose subject was "Ultrasonics as Applied to Electroplating." Sound to most of us is what we hear but it is also a form of vibrational energy. The human ear is able to detect vibrational energy transmissions up to about twenty thousand cycles per second. These are called sonic frequencies. For the purpose of definition, frequencies above this range are termed "ultrasonic." When ultrasonic vibrations are used in a cleaning medium, soils can be removed at greatly accelerated rates and to a degree otherwise unattainable as compared with the usual cleaning methods. The cleaning phenomenon occurs as a result of the mechanical scrubbing action that takes place as the fluid is ruptured and then reformed (cavitation). During cavitation, microscopically sized bubbles (voids) impinge on surfaces and by virtue of their great force explode and physically remove adhering deposits on surfaces. Basically, every installation needs (1) an ultrasonic generator, (2) a set of matched transducers and (3) a process tank.

The power outputs are available from about sixty watts for small laboratory equipment to giant generators furnishing an output of many kilowatts. The transducers may be of (1) quartz, (2) barium titanate and (3) lead zirconate. Barium titanate transducers operate around 40 kilocycles and the lead zirconate around 25 kc. Generally, the work should be as close as possible to the radiating surface,

BOSTON ANNUAL TO FEATURE AES RESEARCH

The technical program of the 24th Annual Banquet and Technical Session of the Boston Branch, AES will be entirely devoted to the important subject of research. The annual affair will be held at the Hotel Statler-Hilton in Boston, on Saturday, September 17.

Three papers will be presented starting at 2:00 p.m. James D. Thomas, General Motors Research Laboratories and 1959–60 Chairman of the AES Research Committee, will speak on "AES Research." Clyde Kelly, American Plating Co., Des Moines, Iowa, Research District Supervisor and a past national president of AES, will discuss AES Research Project No. 18, "Mechanical Finishing of Metal Surfaces." "Accelerated Corrosion Tests," Project No. 15, will be presented by Cleveland F. Nixon, head of the electrochemistry department, General Motors Research Laboratories, 1951–52 AES National President, and Research District Supervisor.

The ladies will attend a matinee performance of a new show prior to its Broadway opening while the men are at the technical session.

The banquet starts at 7:00 o'clock with a roast beef dinner, followed by the distribution of door prizes, entertainment and dancing to Maury Castle's band. George J. Marotta is the chairman of the affair and his wife, Mrs. June Marotta is the ladies chairman. Librarian Robert L. Pierce is in charge of the educational program.

BRANCH SECRETARIES

Branch News is required of all Secretaries monthly by AES Bylaws. First of the month is Branch News deadline for next PLATING issue. Any items on hand on that date will be carried in that edition. Later arrivals will appear in the issue immediately following. In reporting talks given by speakers before the Branch, please give titles of the talks, the speakers' full identification and any other pertinent information of interest to other Branches and PLATING's broad readership.

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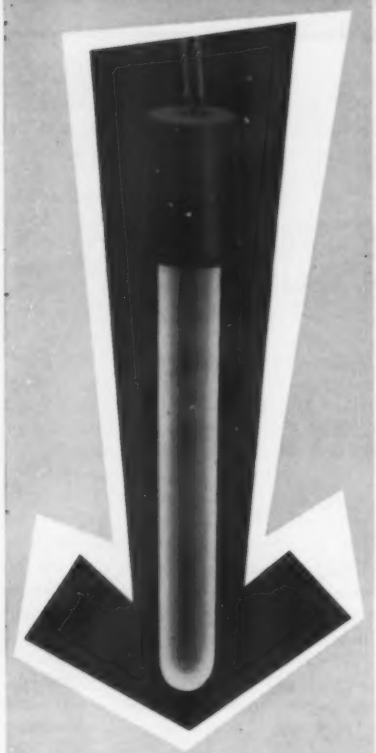

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with the most difficult to clean, face exposed directly to the ultrasonic radiation. Heavy parts usually require more input than light weight parts and thin parts will transmit energy to blind holes and recesses more readily than thick heavy sections. Cavitation falls off as frequency rises, therefore, low frequencies are generally superior for cleaning, 25 kc. appears best. Mr. Carmichael then discussed the applications such as removing buffing compounds prior to gold plating, cleaning prior to plating and where rejects ran from 6–10 per cent and lowered to about one per cent and another application of leaching cyanide salts after plating. Ultrasonics have proven to be of great value wherever great cleanliness is desirable, or where it is worth-while to improve speed, eliminating costly cleaning solutions or laborious hand operations.

Mr. Carmichael, after a lively question and answer period, was given a rising vote of thanks for his very interesting and illustrated talk. This concludes the technical sessions for the 1959–60 season and there will be no business meetings during the months of July and August. Si Gary must be commended on the choice of subjects which were presented for the members of the Chicago Branch.

Christopher Marzano
Publicity Chairman

DENVER
Rice Talks on Metal Preparation; New Officers Installed

The Denver Branch met June 10 at the Mine and Smelter Auditorium. During the meeting the following officers were installed for the 1960–1961 year. **Bob Martin,** president; **Bob Whyman,** first vice president; **Jim Jenkins,** second vice president; **Elmer Schuster,** secretary; **Jim Lewis,** treasurer; **Harry Schoonover,** librarian; **Edgar Hotchkiss, Duane Poucher** and **Dick Venier,** board of managers. During the meeting it was decided to hold all future meetings at the Oxford Hotel starting at 8:00 p.m. on the second Thursday of each month.

After the meeting the speaker, **Jim Rice** of the Behr-Manning Co., gave a talk on Metal Preparation Prior to Plating. A movie was then shown on the use of abrasive belts with details on the use of various types of drive wheels, set-ups to achieve special results, and the use of fixtures for holding the work. The speech gave many of the members ideas on how to improve their operations in the buffing room.

Elmer Schuster
Secretary

KANSAS CITY
Plating Problems Discussed by Pavlich

The April 14 meeting featured a talk on "Problems in Plating" by **Arnold Pavlich** of the Cleveland Supply Co. While offering nothing new or earth-shaking such as the ideal cleaner or the perfect plating bath, everything Mr. Pavlich had to say should be of immense help to anyone engaged in any phase of this industry.

Mr. Pavlich reminded his listeners that all problems in plating have an explanation. None are ever solved by "Black Magic." He also urged that in correcting a problem, everything should not be changed at once. It is very important not only to solve the immediate problem, but also to know and transmit to others just what was done. He called attention to the fact that the literature is repetitive and full of just such information for the guidance of everyone. Numerous examples of causes of trouble were cited in cleaning, pickling, plating, drying, rinsing and other steps in a process. The amounts and effects of contaminants were discussed. As was mentioned, nothing of extreme importance stood out, just good advice to everyone concerned.

In the business meeting which preceded Mr. Pavlich's talk, President **Scott Sterrett** announced that the May meeting would be the time for the annual election of officers. He appointed **Olin Bock, Bill Brumwell** and **Bob Garrett** as a nominating committee to present a slate of candidates to the membership through the monthly Newsletter.

The secretary read a copy of a letter from the National Research Committee which informed the membership that this Branch now had its first Sustaining Member with the acceptance of the application of Bendix Aviation.

Librarian **Bill DesJardins** announced the topics and speakers for the next two meetings and introduced a visitor from the St. Louis Branch, **Dale Thomas** of Sommers' Brothers, who in turn introduced the speaker of the evening.

Robert L. Garrett
Secretary

KANSAS CITY
Beckwith Speaks on Duplex Nickel

The Kansas City Branch met on May 19 at Regan's Restaurant. Eighteen members and guests assembled for dinner at 7:00 p.m.

The meeting was opened at 8:00 p.m. by President **Scott Sterrett.** The officers elected for the year 1960–61 are **Warren B. Eliot,** president; **William E. DesJardins,** first vice president; **Robert L. Garrett,** second vice president; **Richard E. Loupee,** librarian; **Robert C. Garland,** treasurer; **Robert W. Davis,** secretary; **Glen Wilson, Olin Bock** and Scott Sterrett, board of managers.

After some discussion on the subject of a picnic or party, a motion was made, seconded and passed to appoint a committee with authority to arrange a social gathering of some sort in the month of

October. With the approval of the president-elect, the president appointed the following committee: **William Brumwell,** chairman; **Richard Loupee,** Glen Wilson, Robert Davis, Robert Garland.

Librarian Bill DesJardins introduced the speaker, **Dr. M. M. Beckwith** of the Harshaw Chemical Co. who titled his presentation "Duplex Nickel."

Dr. Beckwith began with a brief history of the nickel shortage of 1948 and after, and its effect on the quality of nickel plate. He touched on the various work which had been done to measure the corrosion resistance of this product. He next outlined the events which led to the investigation of the duplex nickel system which was quite accidental and finally he explained this method in detail, illustrating his talk with colored slides. Following his formal presentation, he answered many questions and led a very interesting open discussion.

Robert L. Garrett
Publicity Chairman

KANSAS CITY
Metalizing Explained by Henneman

The often postponed program on Vacuum Metalizing was finally presented to the Kansas City Branch on June 9, last meeting of the 1959–60 season. Nineteen members and guests assembled at Regan's Restaurant heard **William Henneman** give a complete and concise explanation of this process which supplements rather than competes with electroplating.

After being introduced by the Librarian **Bill DesJardins,** Mr. Henneman outlined the principles of the process, illustrating with diagrams, so that those to whom this was brand new could begin at the beginning. After the basic idea was clear, he showed pictures of equipment, typical installations, practical applications and actual operating cycles. As he explained, most of the installations of this process use aluminum as the metal deposited and most of the applications are decorative, but he mentioned other metals which can and are being metalized and applications which are functional rather than decorative. The many questions and discussions which followed his prepared talk attest to the intense interest which he promoted.

Dick Loupee reported for the committee appointed at the previous meeting to arrange a social event for October. Mr. Loupee has been looking into the possibilities of the Branch attending one of the KU football games at Lawrence as a group and with a chartered bus. The committee was authorized to go ahead, obtain the tickets and make bus arrangements.

Since this was the last meeting at which he would preside, President **Sterrett** thanked the Branch for its cooperation,

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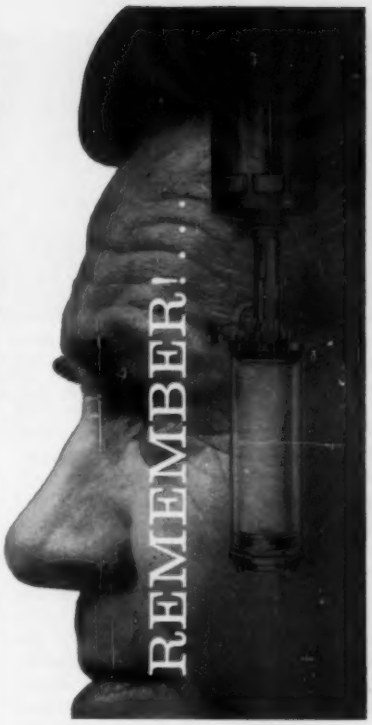

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greeted the new officers and wished the new president, **Warren Eliot,** well in all that he would attempt in the coming year.

Robert L. Garrett
Secretary

LOS ANGELES
Trankla, Karczynski and Rogers are Speakers

The meeting was called to order at 8:35 p.m. by President **Frank Virgil. Oscar Grizat,** Sgt.-at-Arms, introduced the guests.

Emmet Babcock introduced one man who has applied for membership. Six new members were accepted.

Truman Stoner reported for the National Membership Committee citing the accomplishments during the past year. Mr. Stoner showed the group the new application blanks for membership and then told of the new 25-year certificates for members which will be available in the near future.

George Hetz, Convention Committee Co-Chairman, reported that the forthcoming convention will be one of the biggest and the best. **Earl Arnold,** Educational Chairman, has a full educational program including a day devoted to a symposium on hydrogen embrittlement. Mr. Hetz also reminded the group of the many activities for the women and children at the Convention.

Bill Lidtke, Research Committee Chairman, reported that the magazine for the convention will be ready the middle of July.

Dan Ross introduced the guest speakers. **Joe Trankla** of Anadite, Inc. spoke on the types and properties of hard anodized coatings; **R. W. Karczynski** of Douglas Aircraft, discussed the problems and variables encountered in color anodizing and **Bill Rogers,** Harvey Aluminum, spoke on the metallurgy of aluminum and mill problems which could affect the anodizer. These talks were highly informative and were followed by many questions from the floor.

Burton G. Adams
Publicity Chairman

MIAMI
Dent Speaks at Own Branch; Fishing Trip Planned

The regular monthly meeting was held on June 17. In view of the fact that some of our members will be in California in July, there will be no July meeting. There will be a Nite Fishing trip planned for the third Friday of August for a night of good fellowship and fun.

The speaker of the evening was **M. H. "Duke" Dent** of Pan American World Airways. His subject was "The Aspects of Processing and Plating High Tensile Stressed Aircraft Steel as Used in Jet Aircraft Landing Gear."

The steels now being used are the 4340 series—high in chromium, nickel and molybdenum. Rated at 220–280 psi instead of prior materials rated at 200000 psi maximum.

Standard methods of cleaning of materials in chemical ore electrochemical bath had to be eliminated because of the hydrogen embrittlement of the steel. Vapor blasting was not the answer to the problem. It was then resolved that blasting either with silica sand or aluminum oxide would give the required result.

Another procedure that must be followed is the pre-baking of the materials for eight hours at 375F. for stress relief as well as the same baking cycle after plating.

Grinding of these materials has been eliminated because of the surface cracks that develop from the heat generated by the contact of the grinding wheel to the high tensile strength materials. The use of brighteners in cadmium solutions has been discontinued.

Mr. Dent's talk was not only informative but evoked a great deal of interest, as was evidenced by the question and answer period that followed. Even the serving of a collation did not stop the interest.

Abe Schorr
Secretary

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MILWAUKEE BRANCH OFFICERS INSTALLATION AND OLD TIMERS

(Left) 1960–61 officers, left to right. Sy Taterzynski, Past President; Gene Piellusch, President; Art Linn, First Vice President; Clinton Host, Second Vice President; Leslie L. Diveley, Secretary-Treasurer; Curt Hunsaker, Librarian; Ted Sobczynski, Board of Managers. (Right) The Old Timers: Back row, Henry Bornitzke, Dexter Rhodes, Robert Goodsell. Front row, John Anglim, John Foley, Rodney Olsen, Al Hermansen, Harry Unke, Joseph Birbaum, Nick Servatius.

MILWAUKEE

Parisho Discusses AES Membership

On May 13, the Milwaukee Branch held its 508th regular meeting, devoted to the promotion of membership. Of prime interest in the transaction of Branch business was the election of officers for the 1960–1961 fiscal year. The members elected to office were: president, **Eugene Piellusch**; first vice president, **Arthur Linn**; second vice president, **Clinton Host**; secretary-treasurer, **Leslie Diveley**; librarian, **Curt Hunsaker**; board of managers, **Ted Sobczynski**; **Robert Steuernagel**, Leslie Diveley, **Herman Tessmann**, delegates.

Since this meeting was devoted to Membership Promotion, the president relinquished the chair to Ted Sobczynski, chairman of the membership committee. After welcoming prospective member guests, the chairman introduced national membership committee member **George Parisho** who spoke on the "Value of Membership in the AES."

In his talk, Mr. Parisho presented a thumbnail sketch on how the Society grew from an embryonic group of interested men gathered together in New York City to an International organization with 58 branches spread over the USA, Canada and Australia with roughly 8000 members who expanded, from just electroplating, into the fields of organic coatings and allied metal finishing arts.

It was explained how the National AES served its numerous branches educationally through its publication PLATING, the National Conventions, TECHNICAL PROCEEDINGS, the numerous Research Programs and other services designed to help its members and the industry devoted to the finishing of metals.

The chain from the National Office was traced to the Regional Councils, to the Branches and finally to the individual strong links which make up the strength and vigor of the AES—*The Individual Member*.

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A review was made of significant research and educational activities, past, present and future, which illustrated how membership in the AES exceeded by far in worth the monetary expenditure of the individual membership dues. Through the medium of a parable, it was illustrated how an individual member, through a little extra personal effort in AES activities, could obtain an even greater return on his investment in the Society.

In closing Mr. Parisho left the member ship with the following thought: "The more you put into your AES, the more you get out of it."

While partaking of refreshments the membership mingled with and welcomed invited guests who were eager prospects for membership.

Sy Taterzynski
President

MILWAUKEE

Old Timers Honored; New Officers Installed

Members and guests of the Milwaukee Branch of the AES gathered together in a festive mood for its Annual Pabst Blue Ribbon dinner meeting on June 1. This meeting was dedicated to honoring the "OLD TIMERS" of the Branch.

Of the original 12 members who founded the Milwaukee Branch in 1913, three are still active. Only one of these, **Joseph Birbaum,** was able to be present. Joe Birbaum served as Branch president from 1916 to 1918 and is now an Honorary Member of the Branch. Other Old Timers who were special guests of the Branch were **Nick Servatius, John Foley, Dexter Rhodes, Al Hermansen, Bob Goodsell, Rodney Olsen, Harry Unke, Irv Hermann, John Anglim** and **Henry Bornitzke.**

Messrs. Bornitzke, Foley, Servatius and Birbaum were called upon to address the members and each was reminiscent of the organizational problems, comradeship, helpfulness and devotion of the founders of the Branch who were united by a common interest—PLATING.

The regular order of business was dispensed with and Dexter Rhodes installed the new officers of the Branch, presenting each with an Officers Manual to guide them in the duties of their office. **Sy Taterzynski** was presented with a Past President's pin.

The new president, **Gene Piellusch,** assumed the duties of his office and spoke briefly on plans for the coming year before adjourning the meeting.

S. Taterzynski

NEWARK

Panel Program Helpful and Popular

President **John Banta** called the June 17 meeting to order at the Hotel Robert Treat. About 50 members and guests were in attendance which was quite good as it was a very hot humid evening. Six new members were elected.

Cy LaManna gave a resume of next year's program and the status of the Electroplating Course.

We heard from **Jim Conolly** who is working on an Air Force base in Alaska.

A more suitable plaque is to be made for the Lou Donroe Award. The president appointed a committee consisting of Messrs. LaManna, **Meyer** and **Abazia** to have this job done in time for the September meeting.

Cy LaManna introduced a question and answer period. The panel of experts consisted of Messrs. **Ehrhardt, Foulke, Korbelak, Kosmos** and **Lowenheim. Mario DiChiara** was in good form, both serious and humorous, so he was asked to join the panelists.

Numerous questions were submitted covering a wide variety of items. Questions were raised on how to vapor degrease light stock metal details; solderability tests; how to prevent reduction of rhodium on the sides of containers and how to pickle nitrided steel and alnico. Some questions were of theoretical nature.

Attempts were made to answer all questions either directly or by reference to another source. It was a lively period and before long the audience participated with numerous valuable suggestions. However, despite the seriousness of the many problems, many were also dealt with in the humorous vein. After approximately seventy minutes the members adjourned to partake of beer, cheese and crackers while the discussions continued until midnight. It was a very fruitful evening.

Gustav Bittrich
Assistant Secretary

PROVIDENCE-ATTLEBORO

Strow Talks on Metal Stripping; Taylor on Blasting and Tumbling

The February meeting of the Providence-Attleboro Branch was held on the 15th in the Providence Engineering Society Bldg., 195 Angell Street.

President **Ferguson** discussed the preliminary arrangements for the All Day Symposium at the University of Rhode Island on May 21. The committee under the direction of **Dean Crawford** and **Dan Cashman** are rapidly tieing down all the details on speakers and arrangements.

Henry Strow, the speaker of the evening, discussed Stripping of Electrodeposited Metals. Very little new has developed in this field with the exception of nickel. The recent developments in nickel strippers in the past ten years has been the combined use of oxidizing agents and stable chelates. The cost is high—$4.00 to $6.50 per pound of nickel which again proves the old adage "Do it right the first time."

The March meeting was held the 21st in the Providence Engineering Bldg. President Ferguson appointed **Phil Clarner,** chairman, **Sibley Kershaw** and **Gerald Noonan** as a nominating committee to bring in a slate of officers for the coming year.

The speaker of the evening was **Richard D. Taylor,** Eastern sales manager of the Lord-Techline Div. of the Wheelabrator Corp. Mr. Taylor discussed Applications of Wet Blasting and Vibration Tumbling.

Edward A. Parker
Secretary

PROVIDENCE-ATTLEBORO

Cyanide Copper Plating Presented by Doughty

The April meeting was held on the 18th at the Providence Engineering Society Building. **S. Lewis Doughty,** the speaker of the evening, discussed Recent Advances in Cyanide Copper Plating.

Final plans for the Plating Conference at the University of Rhode Island in Kingston on May 21 were announced.

The following slate of officers for 1960–61 was proposed by **Phil Clarner,** chairman of the nominating committee. Since no other candidates were proposed from the floor, the secretary was instructed to cast the vote for the slate. **Daniel Turner,** president; **C. L. Capobianco,** first vice president; **George Belcore,** second vice president; **Clifford Healey,** secretary; **Sibley Kershaw,** treasurer; **Granville Robbins,** librarian; **Pierre Lonsbury, Gerald Noonan** and **Edward Parker,** board of managers.

Edward A. Parker
Secretary

PROVIDENCE-ATTLEBORO

Industrial Plating Conference

An all day conference on Industrial Electroplating and Metal Finishing sponsored by the University of Rhode Island and the Providence-Attleboro Branch, AES, in cooperation with the Manufacturing Jewelers and Silversmiths of America, Inc. was held at the University of Rhode Island at Kingston, May 21, 1960.

The morning session was a general get together and conducted tours of the new engineering and chemistry buildings of the University.

At the luncheon, **Dr. Francis Horn,** president of the University of Rhode Island, extended greetings and discussed the plans that are in process to double the campus and the enrollment in the next ten years.

The afternoon technical was introduced by President **H. L. Ferguson** of the Providence-Attleboro Branch. The first speaker was **Dr. Walter Meyer,** president of Enthone, Inc., who discussed the many phases of Acid Pickling and Bright Dipping.

Byron Abedon, vice president of Engineering Products and Specialties, Inc., Pawtucket, R. I., discussed the similarities of Anodizing Aluminum and the Plat-

Dr. Walter R. Meyer addressing the 90 conferees from Massachusetts, Connecticut, Rhode Island, New York and New Jersey at the University of Rhode Island. The conference was co-sponsored by Providence-Attleboro Branch. On the speakers platform, l to r, Dr. Eric Laue, Dr. Meyer, Byron Abedon and Branch President H. Leslie Ferguson.

ing of Aluminum. Actually, anodizing is the electrodeposition of oxygen.

Eldridge K. Camp, staff chemist, IBM Printed Circuit Division, Poughkeepsie, New York, discussed Some Properties of Gold Electroplates as related to Specifications. Hot cyanide gold had a different crystal structure (200) than the bright Hard Golds and an Acid Gold (111). In these preliminary tests the corrosion resistance appeared related to the purity of the plate. The several corrosion mediums —nitric acid, salt spray, humidity and electrographic gave similar results.

Dr. E. Laue, research director of MacDermid, Inc., Waterbury, concluded the afternoon session with a discussion on the more common contaminants in copper cyanide solutions and how they are best controlled.

The attendance of 85—who spent a bright, sunshiny day, the first such weekend in 14 weeks—was much appreciated by the speakers and by the committee. They were a cross section of New England from Maine to New York State.

The day was completed with a cocktail hour and dinner at the Larchwood Inn in Wakefield.

Dean T. Stephan Crawford and **Dan Cashman** of the University and the committee from the Providence-Attleboro Branch are to be commended for the excellent program.

Edward A. Parker
Secretary

PROVIDENCE-ATTLEBORO
New Officers Introduced at Attleboro Dinner

The June 13 meeting was a Morin Roast Beef Dinner at the Portugese-American Hall in Attleboro. Honorary members **Arthur Wood** (Charter Member) and **James Potter** were introduced. **Dean Crawford** and **Dan Cashman** of the University of Rhode Island were also guests of the Branch. A Past President pin was presented to **H. L. Ferguson,** the retiring president. The incoming officers were then introduced.

The chairman of the Attleboro Dinner, **Jack Henry,** is to be commended for a job well done.

Edward A. Parker
Secretary

ST. JOSEPH VALLEY
Winters Discusses Anodes

Forty-one members and guests attended the May meeting. An introduction of members was given. **Walter Manson** announced that for the 1962 Convention, St. Joseph Valley Branch was responsible for one Branch exhibit. **Lou Ague** was appointed chairman of this committee.

Duke Wysong showed the "pot" he received from the Baltimore-Washington Branch. **Dr. Harold J. Wiesner** presented the nominating committee recommendations for the officers for 1960–61: President, **T. D. Shafer;** first vice president, **Jack W. Peterson;** second vice president, Louis Ague; secretary, **Henry A. Meers;** treasurer, **George Shuman;** librarian, **John Devendorf;** board of managers, **Richard Aiken, Edward Darnell** and **Victor Peterson.**

The electroplating school was discussed. Dr. Wiesner offered to serve on a committee to develop the course. **Ray Dearth** also volunteered. **Dr. E. J. Wilhelm** will be contacted as a third member.

Librarian Jack Peterson introduced the speaker, **Jack Winters,** president of Incar, Inc. His topic was "The Anode Side of the Tank." Mr. Winters pointed out that he would discuss the subject from the practical side, rather than the theoretical. Most platers are thoroughly familiar with the cathode side of the tank, but often neglect the anode effects.

A plating system can be broken into three parts (1) Anode compartment, (2) body of solution and (3) cathode compartment. Bath is a "barometer" for what goes on at anode and cathode.

Polarization was discussed. Polarization can be beneficial as in the anodes of an alkaline tin bath. Appearance of an anode is not a reliable guide as to whether polarization occurs. Clean bright appearing anodes may be highly polarized.

Careful observation of the current for a given load and given operating conditions can be helpful in detecting polarizing conditions. Abnormal changes in *p*H of a nickel tank are indicative of polarization. The problems associated with stray currents in unlined steel tanks were discussed.

BOOKS ON FINISHING

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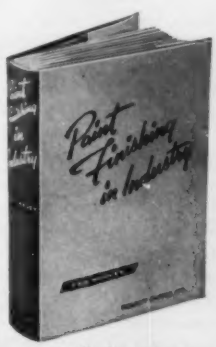
Paint Finishing in Industry by A. A. B. Harvey, M.Sc., M.Inst.W., F.R.I.C.
Published June 1958. 516 pp. 187 figs. 14 tables.
Price $12.25 postpaid.
Every facet of paint finishing metal or wooden products. Contents include cleaning, phosphating, etc.; choice, care and use of spray guns; automatic, hot, catalyst, flock, airless and electrostatic spraying, dipping, flow coating, barrel and centrifugal coating; transfers; silk screen printing; air conditioning; convection and radiant stoving; repair work; stripping; paint shakers, storage and distribution; finishing motor bodies, refrigerators, machinery, castings, wood; industrial finishes; testing.
The Author: Briggs Motor Bodies Ltd., Vauxhall Motors Ltd., Sunbeam Anti-Corrosives Ltd., President Institute of Metal Finishing.



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Burning of pieces at the bottom of racks can occur in unlined tanks. This may be prevented by placing an insulator (plastic sheet) just below the rack. A similar phenomenon of burning can occur on racks near the ends of the tank. Insulators inserted at the ends will help.

Wide variations in current may exist on a rack as it goes through an automatic due to the anodes arrangement (or lack of anodes) throughout the plating tank. This variation can be detected by hanging a current density meter (or an ammeter) on a rack and following it through the plating cycle.

Polarization in barrel plating frequently occurs at the anodes. In order to help this condition, the tank is frequently hooked into the anode circuit. Additional anode area may be gained by making a basket for anodes in the bottom of the tank. Specific problems in plating baths were then discussed.

In cadmium plating, a caustic content of 3 oz/gal should be minimum. At 2 oz/gal a polymerized product of cyanide forms which causes low bright range. In adding caustic, only add 0.5 oz/gal/day until optimum concentration is reached. Do not "slug" bath.

Alloy anodes in zinc baths can polarize where silicon gets into the bath. Metal content buildup can be prevented when zinc baths are idle by using sheet steel as anodes and applying a voltage of 2.1 v. This involves the use of a reversing switch, or a separate small current supply to accomplish the same result.

Winters also discussed lead alloy anodes for use in a chromium bath. Lead peroxide must be formed uniformly in order to increase life of anode and prevent the formation of lead chromate which is a poor conductor.

Anodes should be coated just as if one were anodizing. Anode should be degreased, scrubbed if necessary, and placed in bath with current on.

A lively question and answer period followed this excellent talk.

H. A. Meers

SPRINGFIELD
Golf Outing and Banquet

The Whippernon Club at Russell, Mass. was the scene of activities for the fourth annual golf outing, installation of officers, and banquet, on Saturday, June 11. Events started early in the morning, and continued on until late in the evening.

After the roast beef dinner was polished off, President **Elery C. Gibson** called to order the final meeting of his tenure. First order of business was the installation of officers for the 1960–1961 season. **John E. Costigan,** acting as installation officer, announced that he thought all officers of the outgoing group were to be congratulated on their individual performances to bring the Springfield Branch to its present size and status. He then called on the following electees to stand: President **Alexander R. Salmond,** first vice president **Louis E. Dupuis,** second vice president **Donald R. Barber,** secretary **Henry L. Heissfeld,** treasurer **George H. Mongeau,** and librarian **Leo A. Diamond.** The duties of each office were explained and the new officers were sworn in. The board of managers, as follows, were called on, duties explained, and then also sworn in: **Elery C. Gibson, Edward F. Koetsch Jr., Joseph F. Mitchell, Richard J. Hieronymus** and **Donald W. Gemme.** Outgoing President Elery C. Gibson was presented a past president's pin.

Wayne B. Sanders, chairman of the activities committee, thanked everyone for coming and expressed the wish that all had enjoyed the day. He asked for a round of applause for the committee who worked so hard to make the affair such a success. The following were on the committee: **Robert J. Girard,** Elery C. Gibson, Alexander R. Salmond, **Roger R. Heroux, Ernest P. Donaruma,** and **Charles F. Griffin Jr.**

Mr. Sanders announced that Elery Gibson had won the Colin Hastie Memorial Award Trophy for the third year in a row. This award was for the member with the lowest net golf score.

A number of golf prizes and door prizes were distributed to members and guests.

As last year's honored recipient of the Order of the Gold President's Pot, Henry L. Heissfeld was called on to pass it on to the one member of the Branch, whom he thought had done the most for the benefit of the Branch. **John E. Costigan** was called forward to accept the Pot.

Henry L. Heissfeld
Secretary

AES MEMBERSHIP REPORT

ELECTIONS

Allentown-Reading: M. J. Elkind
Bridgeport: B. Cauthy, J. Rhoads, W. Pailthorp, G. Wagstaff Jr.
Dayton: D. E. Modie
Denver: K. R. Logue
Hartford: A. S. Lamson
Los Angeles: H. Meagher, E. J. Johnston, E. E. Johnson, F. W. Gilmore, H. K. Hisayasu, F. H. Stuckenberg, W. G. Hartman
Newark: P. Augusta, A. Craft, C. Jaresma Sr., W. H. Mysch, R. Wighton, W. R. Wilczek, R. P. Reid Jr., D. O. Feder, R. P. Sica
New York: I. Ringler
Philadelphia: R. H. Hoffman, E. W. Jones, C. C. Kimber
Phoenix: F. A. Stute
Providence-Attleboro: J. Marandola, J. N. Perham
Rochester: J. Nacca, R. W. Zoberbier
Rockford: H. Mason
Springfield: R. L. Nichols, W. J. Giblo
Member-at-Large: H. Steinke, P. Golisch

REINSTATEMENTS

Chicago: G. Glab
Milwaukee: H. Weiley
New Haven: R. F. Ehrsam

TRANSFERS

Cleveland: G. DeCario to Pittsburgh
Detroit: D. H. Snelgrove to Cleveland, E. Kotcher to Saginaw Valley, C. G. Stratman to Saginaw Valley, R. D. McAleer to Saginaw Valley, H. L. Eves to Western Ontario, R. S. Gould to Western Ontario
Grand Rapids: P. H. Norton to Saginaw Valley
Indianapolis: B. F. Rothschild to Los Angeles
Los Angeles: B. F. Rothschild from Indianapolis
Milwaukee: H. M. Smith to Columbus
Newark- R. Groom from Louisville
New York: N. Foran to Los Angeles
Pittsburgh: G. DeCario from Cleveland
Saginaw Valley: M. Tippman to Grand Rapids
San Francisco: J. Hite
Southeastern: A. H. Kurth from Waterbury
Springfield: J. T. MacDermid to Waterbury
Waterbury: A. H. Kurth to Southeastern

RESIGNATIONS

Bridgeport: J. Gallan
Buffalo: A. C. Thompson
Chicago: R. A. Brown
Denver: G. O. Hulse, A. Rasmussen
Detroit: R. Piazza, R. Barnes, J. E. Woodison, L. M. Schwartz
Grand Rapids: L. W. Chech
Milwaukee: W. B. Gertz, B. H. Schmalfeld, H. Sigwell
Newark: H. Berger, R. Ayres, J. Rivera
Philadelphia: W. F. Brong, A. H. Clem, A. G. Snow
Providence-Attleboro: W. E. Collins
Rochester: R. J. Bailey, L. Morrison
Saginaw Valley: A. J. Medwedeff
San Francisco: C. W. Burkemper, L. Von Logher
Southeastern: J. G. Nichols
Springfield: G. J. Juke
Waterbury: B. A. Hackett
Member-at-Large: L. B. Timmis

SUSPENSIONS

Dayton: R. T. Cochran, E. Hamant, L. Broughman
Providence-Attleboro: R. Ashley, O. Binder, G. E. Mona, R. Prentice, E. Richard
Southeastern: F. J. Stevens
Waterbury: W. C. Maxwell, F. A. Webber

DEATHS

Cincinnati: S. J. Shaw
Cleveland: G. B. Svenson, W. O'Berg
Detroit: M. Borushko
Pittsburgh: G. A. Jersey
Providence-Attleboro: Dr. R. Volterra
Waterbury: K. A. Moody

CORRECTION OF REPORT IN JULY 1960 ISSUE

ELECTIONS

Los Angeles: F. H. Kletka, F. L. Hencke, H. K. Chase, F. C. Hayward, J. T. Hogan, W. R. Hamilton, M. R. Eakin (Miss), C. DeLuca
Philadelphia: J. H. Bell, C. Hobbs, W. J. Johnson, W. Kamarek, J. J. LaRuffa, D. C. Notarfrancesco

TRANSFERS

Los Angeles: D. H. Ross from Chicago, J. Manzella from Saginaw Valley, A. G. Cafferty from Chicago, M. A. Manning Jr. from Philadelphia
Philadelphia: M. A. Manning Jr. to Los Angeles

CLASSIFIED ADVERTISEMENTS

Only "Help Wanted" and "Situations Wanted" will be accepted. Rates: $.20 per word, minimum $5.00. AES Branch Members and Members-at-Large only, in good standing, are entitled (for personal use only) to a total of three free advertisements in any twelve-month period as of first insertion. Last day for inserting advertisements is the 10th of month preceding date of publication. When answering advertisements please address as follows: Box number, PLATING, 445 Broad Street, Newark 2, N. J.

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FINISHING SUPERVISOR—16 years' experience maintaining all plating solutions. Supervised both automatic and hand operated plating—polishing—spraying departments. Seeking position in N. Y.-N. J. area. Reply Box A3, PLATING, 445 Broad St., Newark 2, N. J.

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RESEARCH CHEMIST—Research Associate for American Electroplaters' Society Research Project No. 19, Galvanic Effects Associated with Coating Failure. To work at the National Bureau of Standards in Washington, D. C. Post-graduate work or research experience required. Reply to Fielding Ogburn, National Bureau of Standards, Washington 25, D. C.

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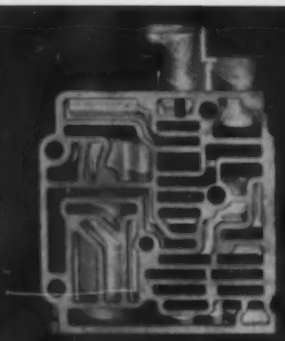

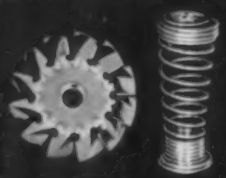

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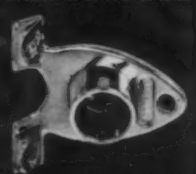

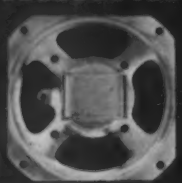

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FUTURE MEETINGS

AMERICAN ELECTROPLATERS' SOCIETY

August 6, 1960—**Detroit Branch Stag Day,** Glen Oaks Country Club, Farmington, Michigan.

September 16, 1960—**Second Metropolitan Regional Technical Session,** Newark Host Branch, Robert Treat Hotel, Newark, N. J.

September 17, 1960—**Boston Branch 24th Annual Educational Meeting and Banquet,** Hotel Statler, Boston, Mass.

September 24, 1960—**Montreal Branch Annual Banquet,** Queen's Hotel, Montreal, P. Q., Canada.

October 29, 1960—**Second Annual Midwest Regional Conference,** University of Notre Dame, South Bend, Indiana. St. Joseph Valley Host Branch.

December 2-3, 1960—**Detroit Branch Annual Educational Meeting and Banquet,** Statler-Hilton Hotel, Detroit, Mich.

December 16-17, 1960—**Newark Branch Annual Educational Session and Christmas Banquet,** Robert Treat Hotel, Newark, N. J.

January 28, 1961—**Chicago Branch Annual Meeting and Banquet,** Conrad Hilton Hotel, Chicago, Ill.

February 3-4, 1961—**Third Annual Dixie Regional Technical Session,** Hotel Roanoke, Roanoke, Virginia. Blue Ridge Host Branch.

February 4, 1961—**New York Branch Annual Educational Session and Banquet,** Hotel Statler-Hilton, New York, N. Y.

February 4, 1961—**Saginaw Valley Branch Annual Educational Session and Banquet,** Frankenmuth, Michigan.

February 4, 1961—**Seventh Annual Tri-State Regional Meeting,** Deshler-Hilton Hotel, Columbus, Ohio.

February 11, 1961—**Eighth Interim Meeting,** Supreme Society, Statler Hotel, Hartford, Connecticut. New England Regional Council, Host.

February 18, 1961—**San Francisco Educational Sessions and Dinner-Dance,** San Francisco, Calif.

March 4, 1961 (Tentative Date)—**Philadelphia Branch Annual Technical Session and Banquet,** Benjamin Franklin Hotel, Philadelphia, Pa.

March 4, 1961—**Dayton Branch 15th Annual Educational Session and Dinner Dance,** Biltmore Hotel, Dayton, Ohio.

FUTURE MEETINGS

April 29, 1961—Milwaukee Branch Annual Educational Session and Banquet, Schroeder Hotel, Milwaukee, Wis.

May 2, 1961—Central Michigan Branch Annual Educational Session and Banquet, Hotel Hayes, Jackson, Michigan.

June 18-23, 1961—48th AES Annual Convention, Hotel Statler, Boston, Mass.

June 25-28, 1962—49th AES Annual Convention, Schroeder Hotel, Milwaukee, Wis. Sponsorship Midwest Regional Council.

June 24-27, 1963—50th AES Annual Convention, Ambassador Hotel, Atlantic City. N. J. Sponsorship Newark Branch.

June 15-18, 1964—51st AES Annual Convention, St. Louis, Missouri.

June 28-July 1, 1965—52nd AES Annual Convention, Statler Hotel, New York, N. Y.

INTERSOCIETY

September 7-15, 1960—2nd Coliseum Machinery Show, Chicago Coliseum, Chicago, Ill.

September 26-30, 1960—Instrument Society of America, 15th Annual Meeting; Instrument-Automation Conference and Exhibit, Coliseum, New York, N. Y.

October 9-13, 1960—The Electrochemical Society, Fall Meeting, Shamrock Hotel, Houston, Texas.

October 12-14, 1960—American Vacuum Society, 7th National Symposium, Cleveland-Sheraton Hotel, Cleveland, Ohio.

October 17-21, 1960—American Society for Metals, 42nd National Metal Exposition and Congress, Trade and Convention Center, Philadelphia, Pa.

October 25-27, 1960—National Association of Corrosion Engineers, South Central Region Conference, Mayo Hotel, Tulsa, Okla.

November 8-11, 1960—Society of Die Casting Engineers, First National Die Casting Exposition and Congress, Detroit Artillery Armory, Detroit, Mich.

Nov. 27-Dec. 2, 1960—American Society of Mechanical Engineers, Winter Annual Meeting, Statler-Hilton Hotel, New York City.

Apr. 30-May 4, 1961—The Electrochemical Society, Spring Meeting, Claypool Hotel, Indianapolis, Ind.

June 25-30, 1961—American Society for Testing Materials, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

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OFFICERS

Executive Secretary.....JOHN P. NICHOLS
445 Broad St., Newark, N. J.

The late July date of the AES's National Convention and the consequent late July date of the Annual Meeting of the Supreme Society at which 1960-1961 National Officers were elected, prevent identifying AES's elected 1960-1961 National Officers in this August 1960 issue. They will be listed in the September 1960 issue.

RESEARCH COMMITTEE

Secretary-Treasurer.....JOHN P. NICHOLS
445 Broad Street, Newark 2, N. J.

The 1960-1961 Research Committee Officers will be listed in the September 1960 issue of PLATING MAGAZINE. (See above under AES Officers.)

1960-1961 COMMITTEE LEADERSHIP

To be announced in September 1960 and subsequent PLATING MAGAZINE issues.

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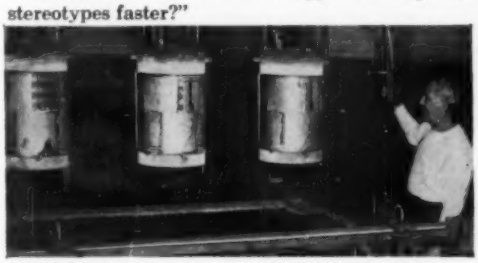

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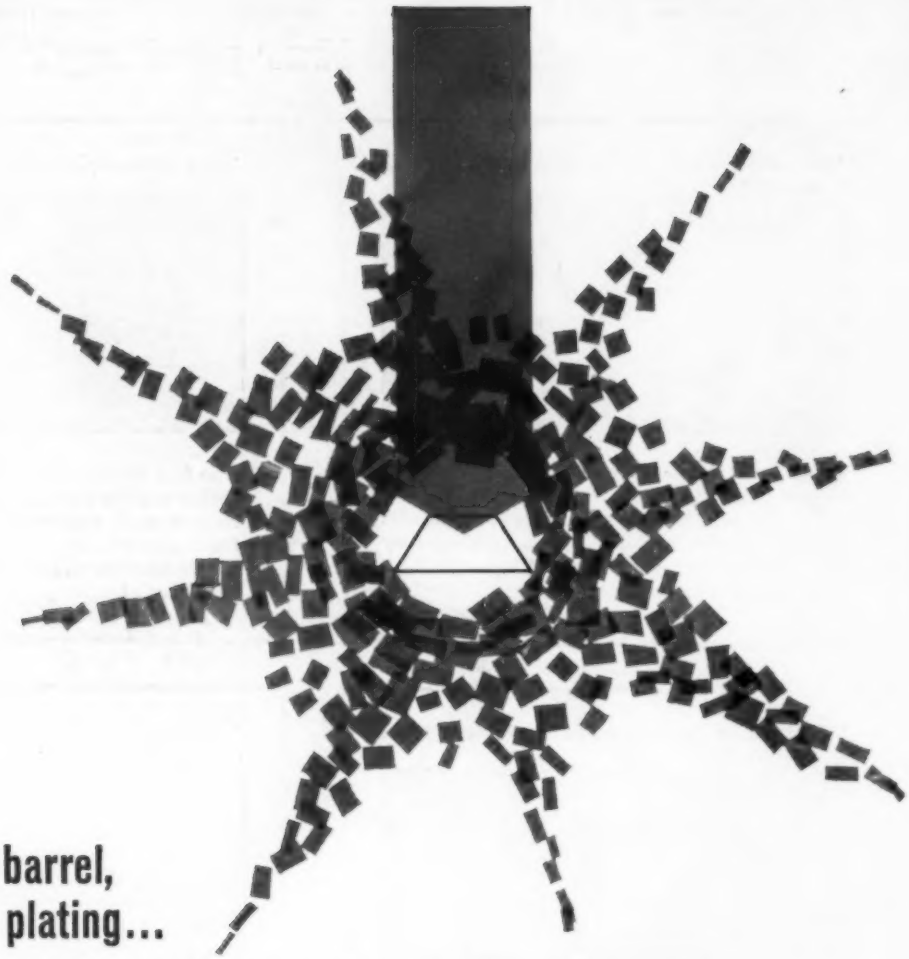

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